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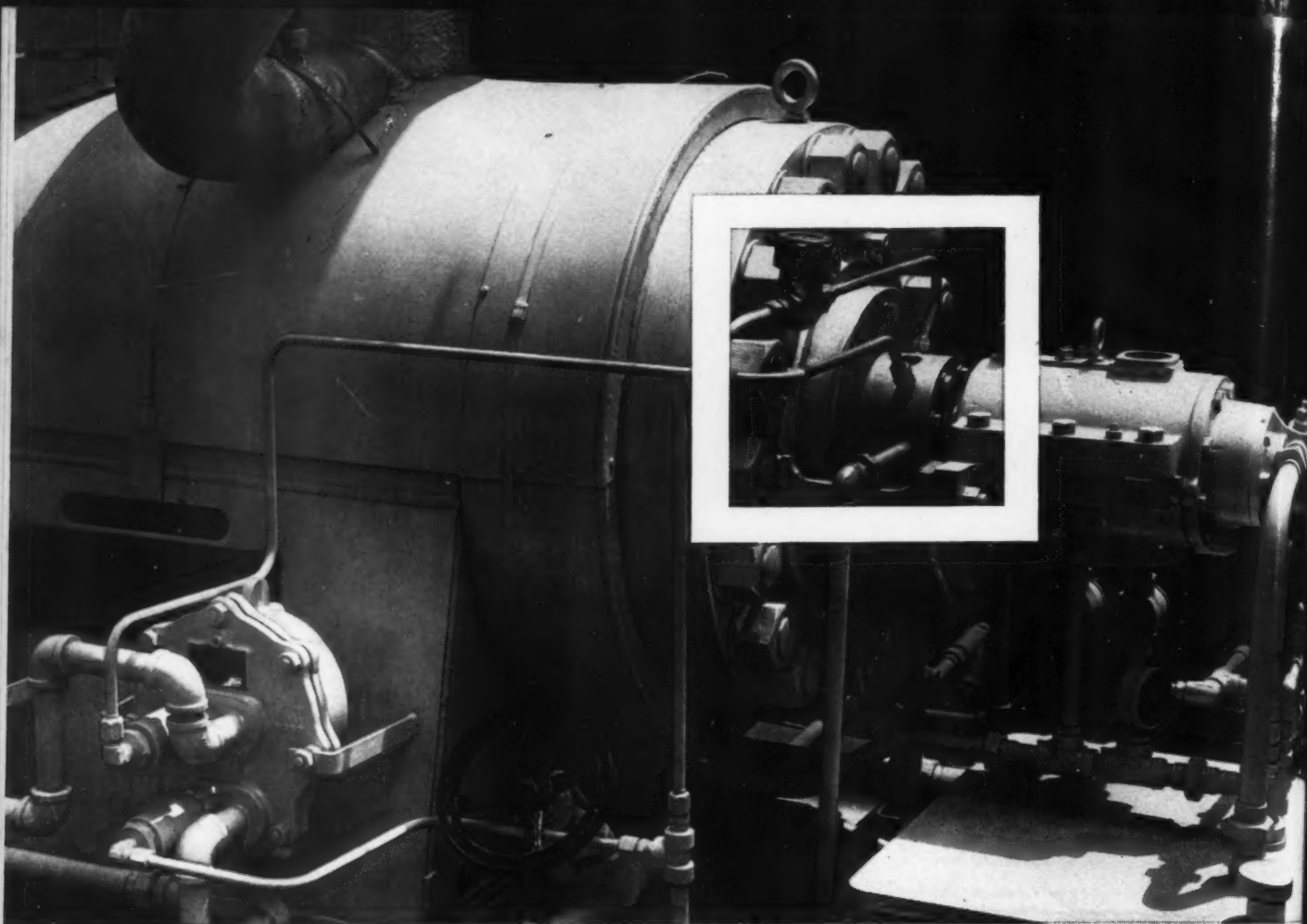
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hat the State Giveth . . .

MAX W. BENJAMIN, president of Boddy, Benjamin and Woodhouse, Inc., of Detroit, is a mechanical engineer who received his graduate B.S. degree from the University of Michigan, in 1926, and who later earned his professional degree of M.E., in 1940. Prior to entering private practice, most of his experience was as an engineer with the Detroit Edison Company. As Steam Power Engineer for this utility, Benjamin was engaged primarily on the thermo-

Continued on page 6



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Consulting Engineer

November 1956

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The Consulting Engineer's Professional Magazine

dynamic and economic studies upon which power plant design and operation are based, developing an interest in this type of engineering that approaches reverence.

In 1946, Benjamin joined H. E. Beyster & Associates, Inc., of Detroit, as head of their steam power department, and then, in August, 1948, started his own firm under the name Boddy, Benjamin and Associates. Initially the firm engaged principally in steam-power engineering, but activities were later expanded to include completely integrated architectural and engineering services when Urban U. Woodhouse, AIA, now vice president, became a partner.

Currently the firm employs approximately 50 men, and has structural, mechanical, electrical, and architectural departments as well as a technical department assigned to the preparation of specifications and the compilation of surveys and reports. This technical department, a result of Benjamin's long interest in thermodynamic and economic studies, serves primarily as advisor to the design groups. About half of the firm's projects are industrial power plants and the other half general industrial buildings.

Throughout his career, Benjamin has been active in technical society work. Since joining the American Society of Mechanical Engineers, in 1931, he has served as Chairman of the Detroit Junior Section, Program Chairman, Secretary-Treasurer, Chairman of the Detroit Section in 1938-39, and Chairman of the A.S.M.E. Power Test Code Committee 4 on Stationary Steam Plants. He also is a member of N.S.P.E., the Engineering Society of Detroit, Tau Beta Pi, and Pi Tau Sigma, and is registered in Michigan, Missouri, and Wisconsin besides holding a certificate from the National Board of Certification.

Benjamin also has served as a special instructor in thermodynamics at Wayne University, lecturing on the design and performance of steam plant equipment. Despite this contact with the field of education, Benjamin feels there is no shortage of engineers — only a shortage of qualified technicians. He does not think that education alone makes an engineer but rather that a man must have some bent — more than just desire — to become truly successful in the profession. He objects to the policy of applying pressure indiscriminately to get people to study engineering, believing that an individual's inborn tendencies and spirit of dedication should be the paramount concern, particularly in view of the current struggle for recognition of the engineering profession.

"My pet peeve," Benjamin says, "has to do with the professional relations, or lack of professional relations, between government and the consulting engineer. With one hand the government sets out to establish the engineer, by law, as a professional man.

Every state now has some sort of engineering registration law, and the Registration Boards agree that engineering licensing is a basic requirement for professional status. These Boards pride themselves on the difficulty of their examinations and the high professional status that accompanies registration.

"Then, the left hand of government reaches out and slaps down the professional dignity of the engineer that the right hand has lifted up. This lowering of the professional standing of the engineer is prevalent in all levels of government—county, state, and federal.

"For example, it is not uncommon for some departments of the State to establish the fee which will be paid for particular architectural and engineering services, and the firm invited to do the work must take it at that price, or refuse it. In addition to establishing a low fee, the department concerned may have architects and engineers on their own payroll who dictate how the work shall be done, who change their minds about what is to be done, and who demand endless detail in the matter of design calculations, material estimates, and the like. It has been known to happen that the project engineer for the governmental agency was transferred to other duties in the middle of a project and the new project engineer did not agree with what had been done under his predecessors jurisdiction. Since none of the work had progressed to the approval stage it was necessary to scrap most of what had been done and start over to suit the new man. At no change in fee, of course.

"At the County level there is at least one Board that is required by law to advertise for bids on any project costing over \$500.00. We learned of this after we had been asked to look into a problem and furnish a letter outlining the recommended scope of work and the engineering fee. Several weeks after our letter had been submitted we received a mimeographed copy of the letter, almost verbatim, which was being sent out as a specification upon which the Board was taking bids from other engineering firms, contractors, and even equipment manufacturers. We declined the opportunity to submit a bid on our own specifications. The work was let, but three years later it had to be done over. The second effort was handled more ethically by a different agency of the County.

"Another case involving ethical relations with government was at the Federal level. The Agency announced that it was ready to negotiate for the engineering services on the project and requested firm lump-sum proposals to include the cost of field surveys, designs, drawings, detailed estimates, and specifications. We replied with a proposal showing a lump sum price.

"This, it seems, would not do at all. To satisfy the Agency's cost-accounting people we were requested to return a breakdown of our proposal showing

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actual manhours, pay rates, material costs, overhead, and profit — all this to be accompanied by a financial statement proving our ability to handle the job. To me, this seems like competitive bidding for engineering services, call it what you will, and we refused the information. To my knowledge the project has never gone ahead. It seems to me that it is time the government agencies learn to recognize the engineer in private practice as a professional man, registered as a professional practitioner by a government agency.

"It is not to be construed from these examples that all government work is subject to unsatisfactory relations. We have done work at the Federal level and are now doing Municipal work that has been handled ethically and with mutual satisfaction. However, in all these cases the men in authority are, themselves, professional engineers. We believe that ethical difficulties, when encountered, result from lack of understanding on the part of those in authority or from the legal restrictions under which they operate.

"As I see it, an important job for the engineering registration boards now is to impress upon those in other branches of the government the fact that the consulting engineer is a professional man who should be dealt with as such.

"It is true that there are some engineers who aid the unfavorable attitude of the government agencies by bidding competitively for projects. It is also true that since engineers, unlike the doctors, must work in groups rather than individually, they appear to be a business operation — like the contractor — rather than a professional body.

"We all recognize there are other factors that resist professional development. All aspects require work, but the first line of approach might well be through the registration boards, for they, as government agencies should be in the best position to bring other government agencies around to ethical relations with consulting engineers.

"Another thing the registration boards might do would be to work with the Corporation and Securities Commissions to deny the use of corporate names implying professional engineering by those not qualified to practice professional engineering. For example, some years ago a phonograph record shop which also sold and serviced record players and radios operated in suburban Detroit under the name of the '_____ Engineering Co. Obviously, the alley tin-shop heating 'engineers' and many others do not come under the jurisdiction of corporation commissions, but there are many firms who do have charters from the State whose corporate names are in violation of the registration law. It should be possible to prevent these violations at the outset and by so doing help to clarify in the public (and government) mind the proper place of the professional engineer."

Synchronous Speed with Induction Simplicity

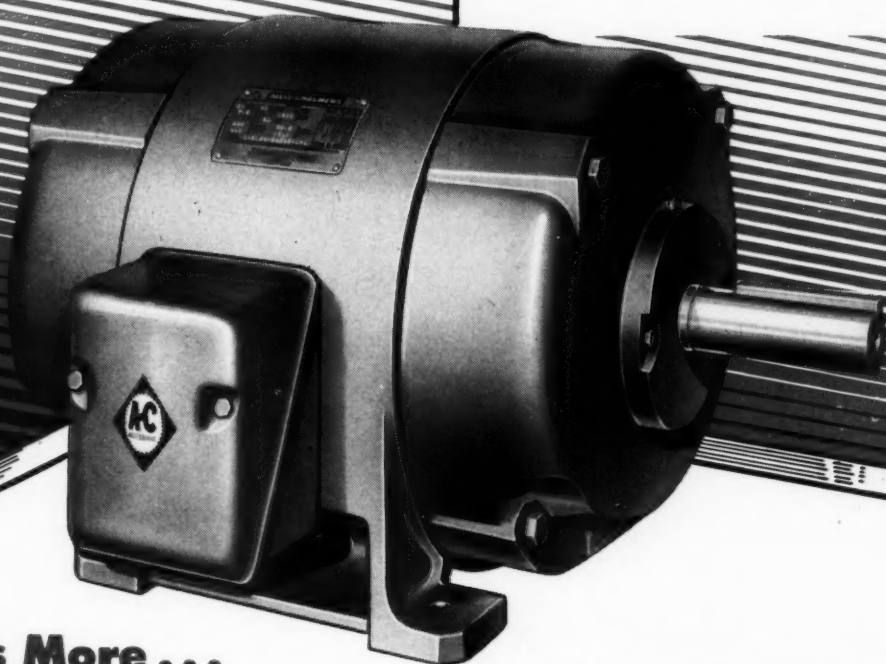
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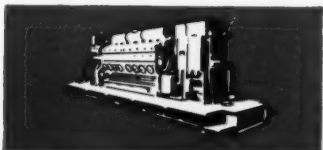
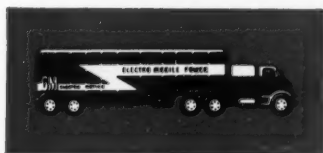
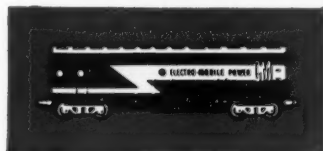
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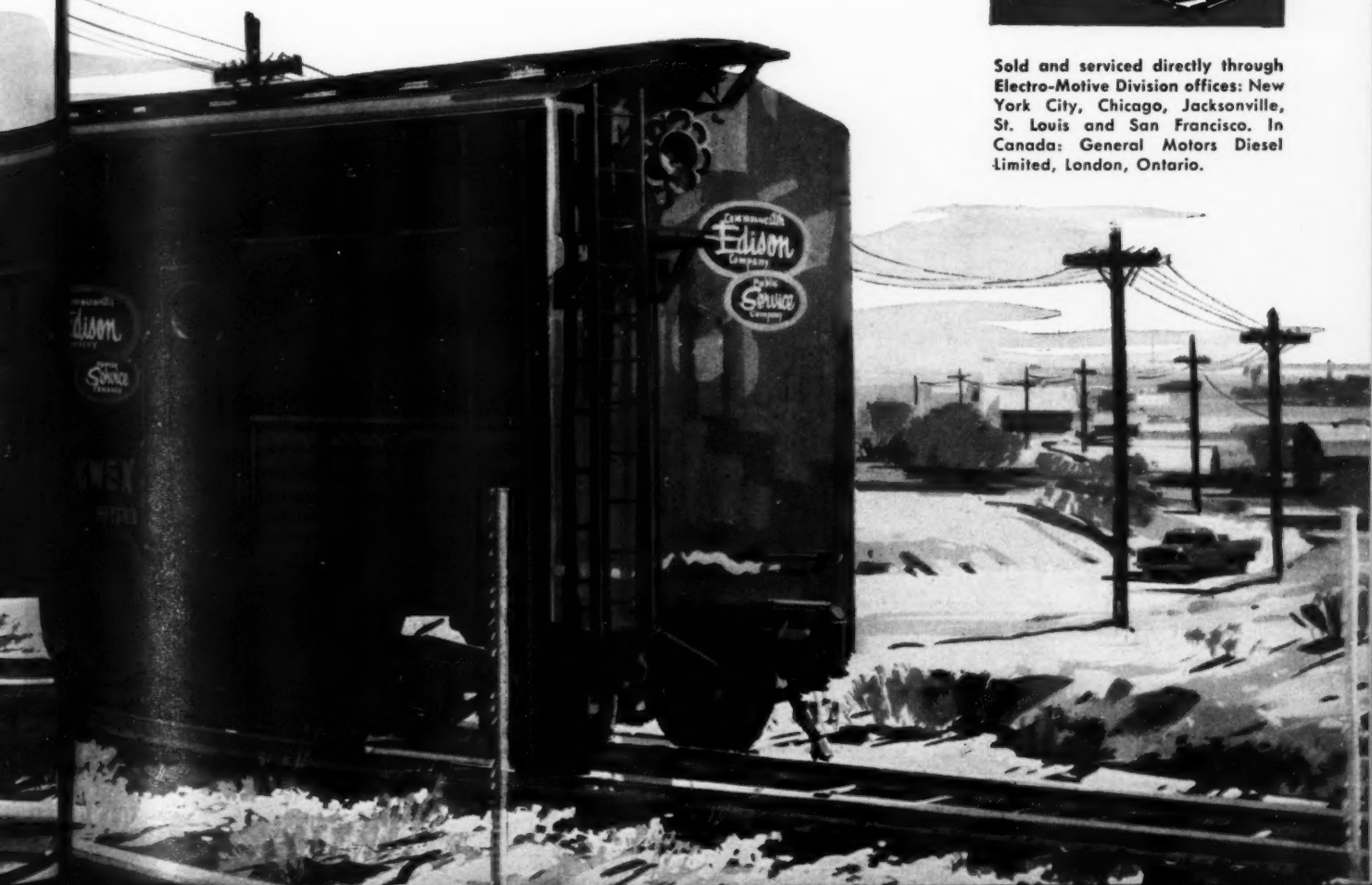
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READERS' COMMENT

C.E.C. and A.I.C.E.

Dear Sir:

I have read with considerable interest your October issue cover story on Carlton S. Proctor. Naturally, I was particularly concerned with his remarks in regard to the relationship between the American Institute of Consulting Engineers and the Consulting Engineers Council.

There has, of course, never been any thought on the Council's part of conflict with the A.I.C.E. and in fact our whole aim has been one of cooperation, which aim, I am glad to see from Mr. Proctor's remarks, is fully reciprocated by the A.I.C.E. We regard the interests of the two bodies as running parallel and look forward to considerable joint work for the benefit of consulting engineers generally.

We also have the thought that perhaps in the future such joint work may lead to a merger of the two bodies in the common interests of consulting engineers across the country, so that the independent consultant may be represented by one strong national organization. Meanwhile, we offer our full cooperation to the A.I.C.E. and look forward to working with them in any way of mutual usefulness.

John K. M. Pryke,
President,
Consulting Engineers Council

Alternate Designs

Sir:

Mr. Roy L. Clark, a consulting engineer here in Des Moines, has just completed a very fine job for us. He has designed a pre-cast concrete bridge beam which has been approved by the bridge engineer of the Iowa Highway Commission as an alternate to their standard design. We think Mr. Clark has done an exceptionally fine piece of work in designing this beam, figuring the various

stresses, the proper reinforcement, and, at the same time, taking into account the forming problems instrumental to its manufacture.

It is our business to furnish materials for the bridges which span road and highway drainage structures in Iowa, and from time to time we have engineering problems. We naturally feel that a consulting engineer is the right man to take care of these problems for us. We regard a consulting engineer just as we would an attorney or a medical doctor, and we would no more think of doing our own engineering work than we would our own medical or legal work.

A good consulting engineer has, in our opinion, a broader, more objective viewpoint than an engineer who is employed solely to do the work of a particular company. He is less apt to be unduly influenced by the sales organization than a company engineer, and this very impartiality tends to cause his work to be more highly respected.

R. E. Hollett, Pres.
Pioneer Lumber Co.
Des Moines, Iowa

Similar Problems

Dear Sir:

Thank you so much for the kind transmission of the periodical *CONSULTING ENGINEER*.

For us in Germany it is especially interesting to learn something about our colleagues (sic) in the States, about their problems, as discussed in *CONSULTING ENGINEER*. Once more again I had been convinced that the problems in the States and in Europe are very much alike in reading your article "Scraps and Shavings" (August CE) — something that we found out during your European tour. Nearly the same percentage of work is going through other channels as mentioned in the article. But

in my opinion the main problem here lies not only in the small number of consulting engineers but in the ignorance of "what is a consulting engineer" and "what's his job."

Here in Germany everybody knows what an architect is doing, knows his job, but not what an engineer is doing. I think there must be a lot of "education" to change men's opinion. On the other hand we have a lot of so-called consulting engineers who don't have the qualifications to work in the large field of engineering work and we have to do our best that they will not lower the level of real consulting activity, which is only in favour of the client.

Hans E. Walter
Koln, Germany

Engage a Consultant

Dear Sir:

... I most appreciate the ads of the National Coal Association but was disappointed this time (Sept., p. 113) when I missed seeing their notation to engage a consulting engineer. We don't have coal here in Oregon, but the fact that the N.C.A. has favored my profession in its advertisements in the past few months makes me firmly wish I could express appreciation. Advertisers who do not offer "free" engineering could very well make such fact known in their advertising.

Chet A. Kershaw
Portland, Ore.

• THEIR OCT. (P. 51) AND NOV. (P. 157)
ADS INCLUDE THE CONSULTING ENGINEER.

Valuable Information

Sir:

Several people have shown interest in my article "Prebuild for Future Needs — or Defer?" which appeared in your September issue...

May I congratulate the staff of *CONSULTING ENGINEER* on the excellent work they are doing with this magazine. I find that it is developing into a very valuable source of information and opinions to those engaged in offering engineering services on the open market.

H. B. Backenstoss
Jackson & Moreland
Boston, Mass.

Swiss E & O Insurance

Sir:

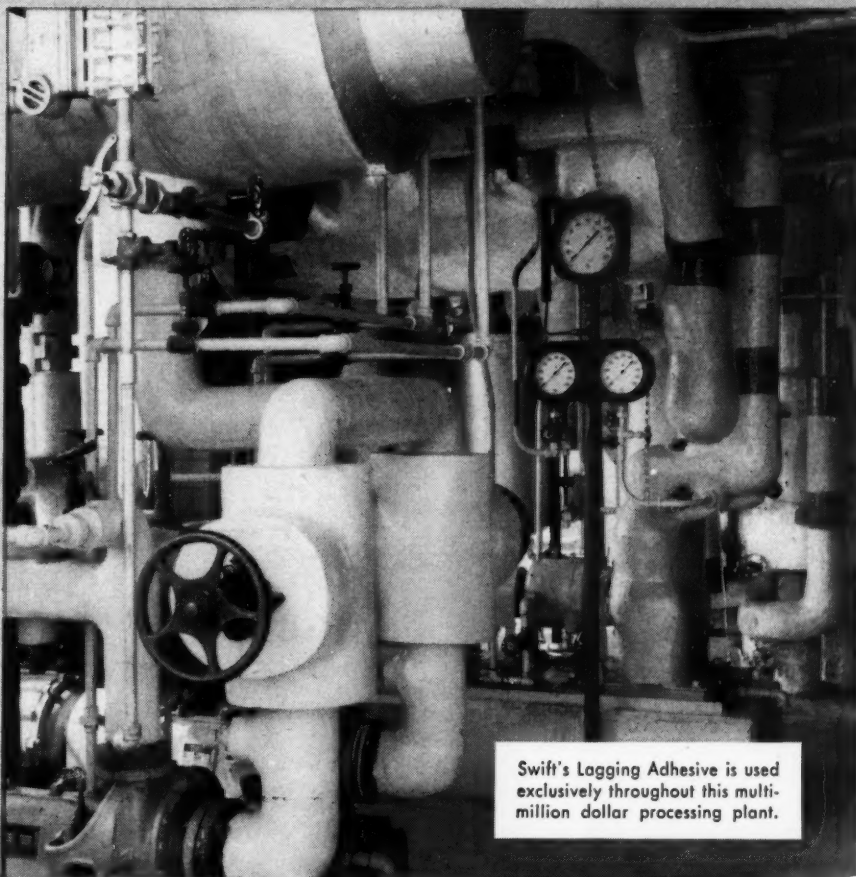
The August issue of *CONSULTING ENGINEER* has just arrived. I have taken much interest in some of the problems discussed, especially the article on "Errors and Omission Insurance." My firm, and many other independent engineers in Switzer-

Swift's *improved* **LAGGING ADHESIVES**

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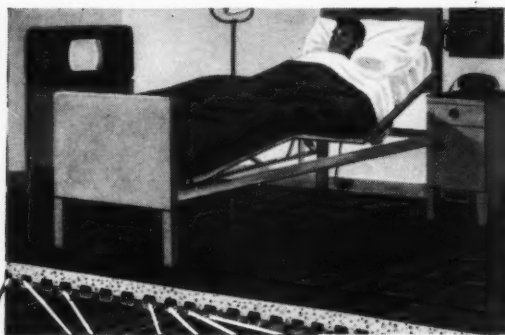
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land have carried such insurance for years and been satisfied with it.

Let me thank you for having remembered my interest in your publication, which I expressed on the occasion of our meeting at Rheinau on May, 1956, and let me congratulate you upon the fine presentation of your magazine.

Hans F. Buchi
Zurich, Switzerland

... And Back Again

Sir:

The engineers on the new Pontchartrain bridge have done a truly outstanding job, but the editors of **CONSULTING ENGINEER** have done an even more uplifting one. They merely built the bridge. You moved it all the way to Florida.

F. William Scott
Earl F. Scott Co.
Atlanta, Ga.

• WE'VE GONE OURSELVES ONE BETTER BY MOVING IT BACK TO LOUISIANA.

Personal Copy

Dear Sir:

Please favor me with one copy of each of the following reprints, if available, which you have so thoughtfully recalled to your readers attention: . . .

I have read most of the above articles as you published them, but unfortunately the reading time was limited and the magazines are not readily available for reference.

I am enclosing your card, filled in, requesting your Form 1-A so that I may apply for the addition of my name to your regular mailing list of your very constructive and worthwhile magazine.

Warren A. Stewart, P.E.
Bechtel Corp.
San Francisco, Calif.

Sir:

At present you are sending **CONSULTING ENGINEER** to my office address, 1225 South Ave., Plainfield, N. J. Please send future issues to the address on this letterhead.

I would like to take this opportunity to say that I consider **CONSULTING ENGINEER** one of the finest publications of its kind, and certainly hope you keep up the good work.

Richard I. Perry
Consulting Engineer
Summit, N. J.

Fees

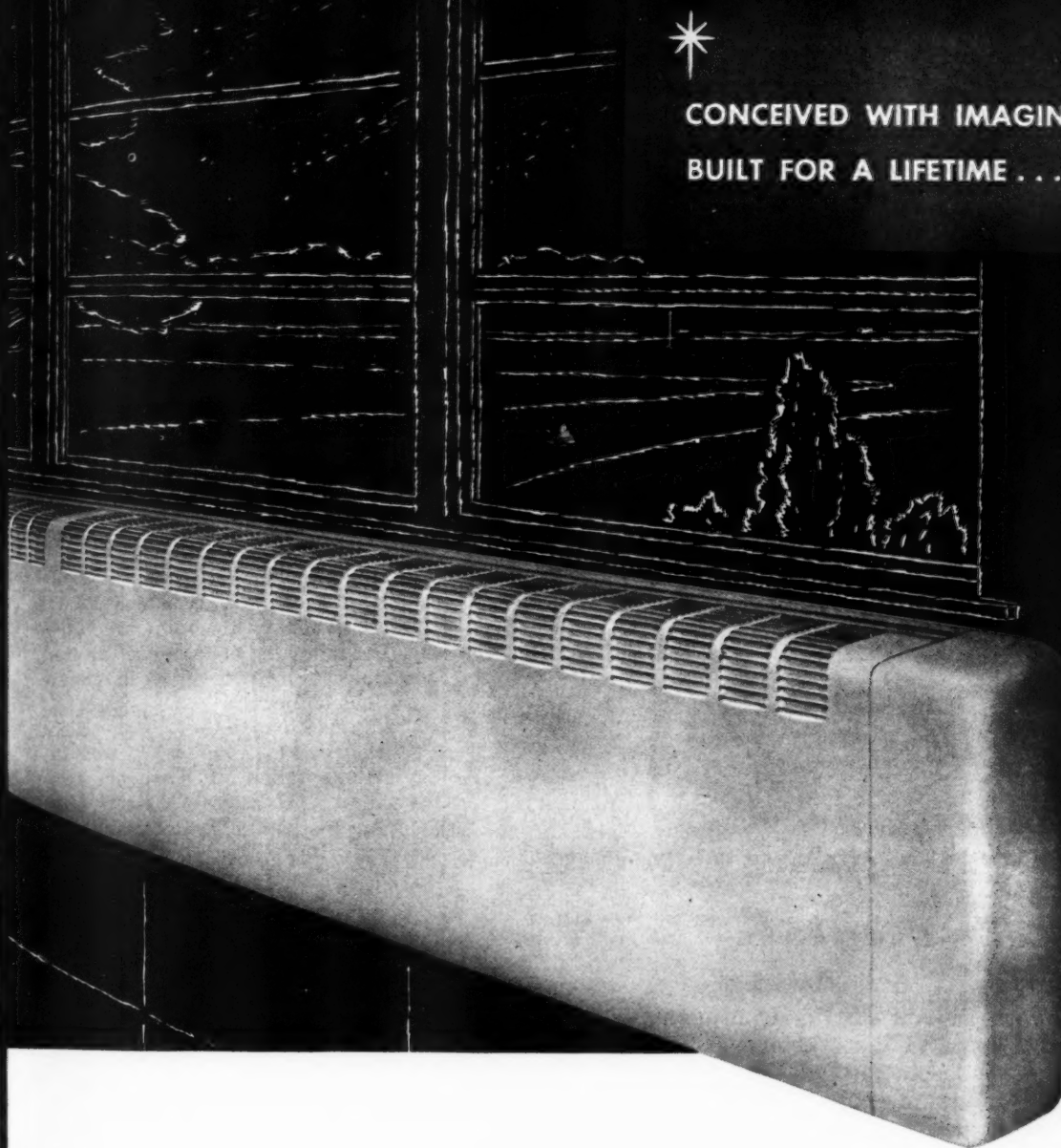
Sir:

The August issue 1956 contained an article "The Consulting Structural Engineer" by Mr. Ketchum.

CONSULTING ENGINEER



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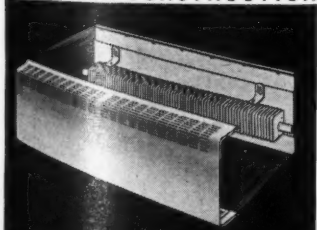
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Like USG's Supergauge . . . with proper application . . . the Solfrunt is built to last a lifetime.

ARC-LOC MOVEMENT—Rugged beyond compare . . . broad generated gear faces, deep stainless steel bushings. Calibration adjustments from rear by merely removing blowout back.

SEGMENT—Stainless steel, with nylon-faced gear section. Nylon-to-metal bond stabilizes the nylon against expansion and contraction . . . maintains accurate pitch diameter . . . assures proper mesh with stainless steel pinion under severe temperature and moisture conditions.

LEGEND ON DIAL—gives complete description of socket, Bourdon tube, and movement material for ready identification.

MICROMETER ADJUSTABLE SELF-LOCKING POINTER—permits accurate repositioning of pointer.

Solfrunt Gauges available in 4½", 6" and 8½" sizes. For complete information on case styles, materials of construction and connections, write for Publication 1819.

UNITED STATES GAUGE
USG
Division of American Machine and Metals, Inc.
Sellersville, Pa.

Home of the **SUPERGAUGE**

The fee schedules were particularly interesting to me. In this area there are no consulting engineering organizations and structural fees seem to vary quite a bit, if I can believe my clients. I'm always very high it seems yet the fees seem to fit your fee schedule very well.

If reprints of this article are available for purchase I should like to send some to my clients.

J. M. Lambert
Lambert, McGee & Costello
Philadelphia, Pa.

• REPRINTS ARE AVAILABLE AND WERE SENT TO MR. LAMBERT.

October Issue Praised

Sir:

(We) Want to congratulate you on the October 1956 issue of **CONSULTING ENGINEER**. It surpasses all other issues, in my opinion.

The following articles are the most complete I have ever read on the various subjects:

H. H. Johnson — "Using Block Diagrams for Planning Process Instrumentation and Control"

John V. Hansen — "Getting More Service from a Technical Publications Staff"

John B. Harju — "Plant Layout . . . Foundation of Industrial Plant Planning"

Your organization can feel mighty proud of attracting men of their caliber to write so effectively on such timely subjects.

We would appreciate your furnishing us the correct address of each of these men as we would like to write them personally and express our appreciation for their worthwhile efforts.

Dan. J. McQuaid
Air-Vu Company
Denver, Colo.

From England

Dear Sir:

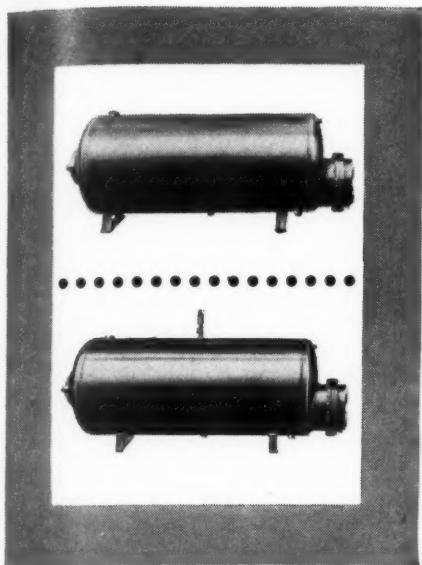
Many thanks for your note and the enclosed booklet on the U.S. consulting engineers visit to Europe and the page from your magazine on our visit to the U.S.A. It's always a little frightening seeing your own face in a magazine!

I hope you are successful in organizing your second trip to Europe and that we may have the pleasure of meeting you.

J. H. Mercer
W. J. Fraser & Co., Ltd.,
Chemical Engineers
Yorks, England

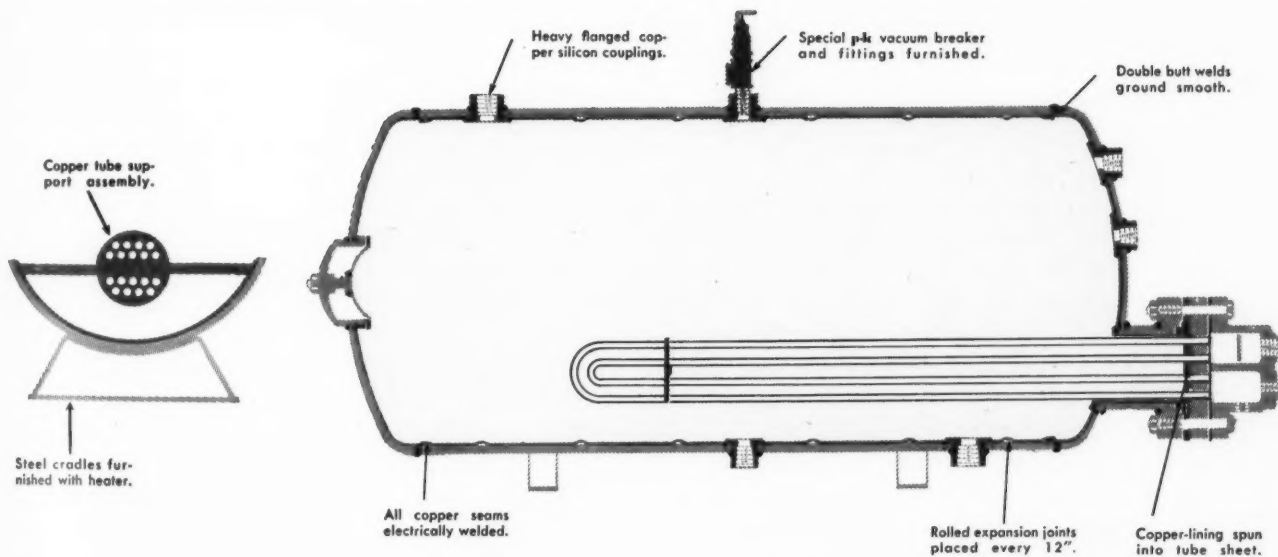
• MR. MERCER WAS ONE OF THE MEMBERS OF THE ENGINEERS' GROUP THAT TOURED THE U. S. UNDER AUSPICES OF THE INTERNATIONAL COOPERATION ADMINISTRATION. ▲▲

CONSULTING ENGINEER



WHICH OF THESE
Copper-Lined HEATERS
WOULD YOU SPECIFY?

ONLY ONE has all these features



Like twins, copper-lined heaters can look pretty much alike—on the outside. But *inside*, and on key points of construction, they can be as different as day and night.

Engineers experienced in copper-lined heaters are aware of these vital differences and specify accordingly.

They insist, for instance, on rolled joints every 12 inches around the full circumference of the lining to allow for longitudinal expansion . . . on the copper-lining being not less than 3 lb. per square foot . . . on heavy flanged copper silicon couplings, welded to both the shell and the lining . . . on enough tube supports . . . on an adequately long tube bundle with parallel "U" bends . . . and on a vacuum breaker valve to protect the lining from sudden pressure fluctuation. They make sure that separate hydrostatic and

pneumatic tests are run to guarantee that linings will be leakproof.

These experts specify these details, and others, found only in P-K heaters, because they know that heaters built *without* such safeguards are false economy; but that heaters "built right," like P-K's "Indestructo" copper-lined heaters, assure trouble-free service year after year.

Like the full story? We've detailed the key construction features in sample specifications and in P-K's new Catalog 19. Ask your local P-K representative for copies or write today.

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NOVEMBER 1956



Scraps & Shavings

THE AMERICAN consulting engineer is equal to or better than his professional contemporary anywhere in the world. He can compete with any engineer on the basis of quality and quantity of work, and he has nothing to be ashamed of when comparing his technical background or his ability to apply engineering knowledge for the benefit of his client. On the other hand, he is far behind the European engineer when a comparison is made of original contributions to engineering knowledge. The U. S. consultant is long on "know-how" but short on original thought. He simply is not giving enough time or spending enough money on original design.

It is common knowledge, certainly among civil engineers, that the most important structural ideas of the past quarter century came out of Europe. Prestressed and poststressed concrete, folded plate construction, and thin shell design were well known in Europe long before we made use of them. This reliance on Europe for the original thought is by no means confined to civil engineering. A tabulation in Samuel Lilley's book, *Men, Machines and History*, shows that a heavy majority of recent inventions in mechanical, mining, and metallurgical engineering came from men trained in Europe. The history of the development of atomic energy further bears out this inequity. While we have the plants and the product, the Europeans did the original research.

Another recent book, *Engineering in History*, by Kirby, Withington, Darling, and Kilgour, says, "American engineers have clearly displayed their creative power in electrical and automotive engineering. The United States generates over 40 percent of the world's electric power, yet Europeans made most of the primary inventions. The growth of American automotive engineering is even more outstanding. In this case Europeans made all the basic inventions."

There is good reason for this state of affairs even if there is no good excuse. Economic conditions in this country make it almost impossible for a consulting engineer to take the time or spend the money necessary for original design work. So long as the

consultant's fee is based on some printed curve indicating a minimum percentage fee, so long will it be impossible to spend the money required.

And so long as clients demand — and get — work in thirty days that should take six months to complete, so long will consulting engineers find their designs restricted.

It is true that the fees of European consultants appear to be no higher than ours. While their clients pay about the same that is paid here for engineering services, the foreign engineer keeps much more of his fee. His overhead and labor costs are far below ours. He can hire good draftsmen and even good designers for the equivalent of \$18 to \$30 a week. Clerical help is even cheaper. Therefore, his profit is much greater than in this country, and he has more money to invest in experimental design.

The contrast is even greater when it comes to time. The European consultant is given more time by his client, and he feels free to take more time than he is given. As a result, each project gets more thought — and sometimes a new engineering idea evolves.

In some parts of Europe it is customary to make use of the alternate design method. Assume, for example, that a highway bridge is to be built across a river. The state requests bids from perhaps ten different contractors, and each of these contractors goes independently to a consulting engineer and pays him to make a design for the bridge. The result is that there are ten separate designs submitted, one for each contractor's bid.

This alternate bid method has many disadvantages, but it does encourage original work. No one can question that competition encourages original design.

It is wrong for the American consultant, who has so much to contribute, to remain a mere purveyor of "know-how." In order to change his status it is necessary to change his business methods. He must ask and get higher fees and more time for design work. In return, he must give the client more for his engineering dollar. It can be done even in an economy now geared to low percentage profits and high output. ▲▲

The Reader's Guide



Harry Kuljian is not the kind of engineer one meets every day. His firm has offices in India, Pakistan, Iraq, and several South American countries. He has designed and supervised construction of large power plants and heavy industry all over the world. His operations are international — but his outlook is American. Perhaps his intense love of the United States and his excellent understanding of international relations is explained by his background. He was born an Armenian; came to this country as a youth; put himself through high school and M.I.T. He is a brilliant engineer and a sound thinker in the field of international finance. His thoughts are worth study. In this issue he tells what is wrong with our foreign aid policy ("An Engineer Looks at Foreign Aid") and makes sound suggestions for solving the problems.

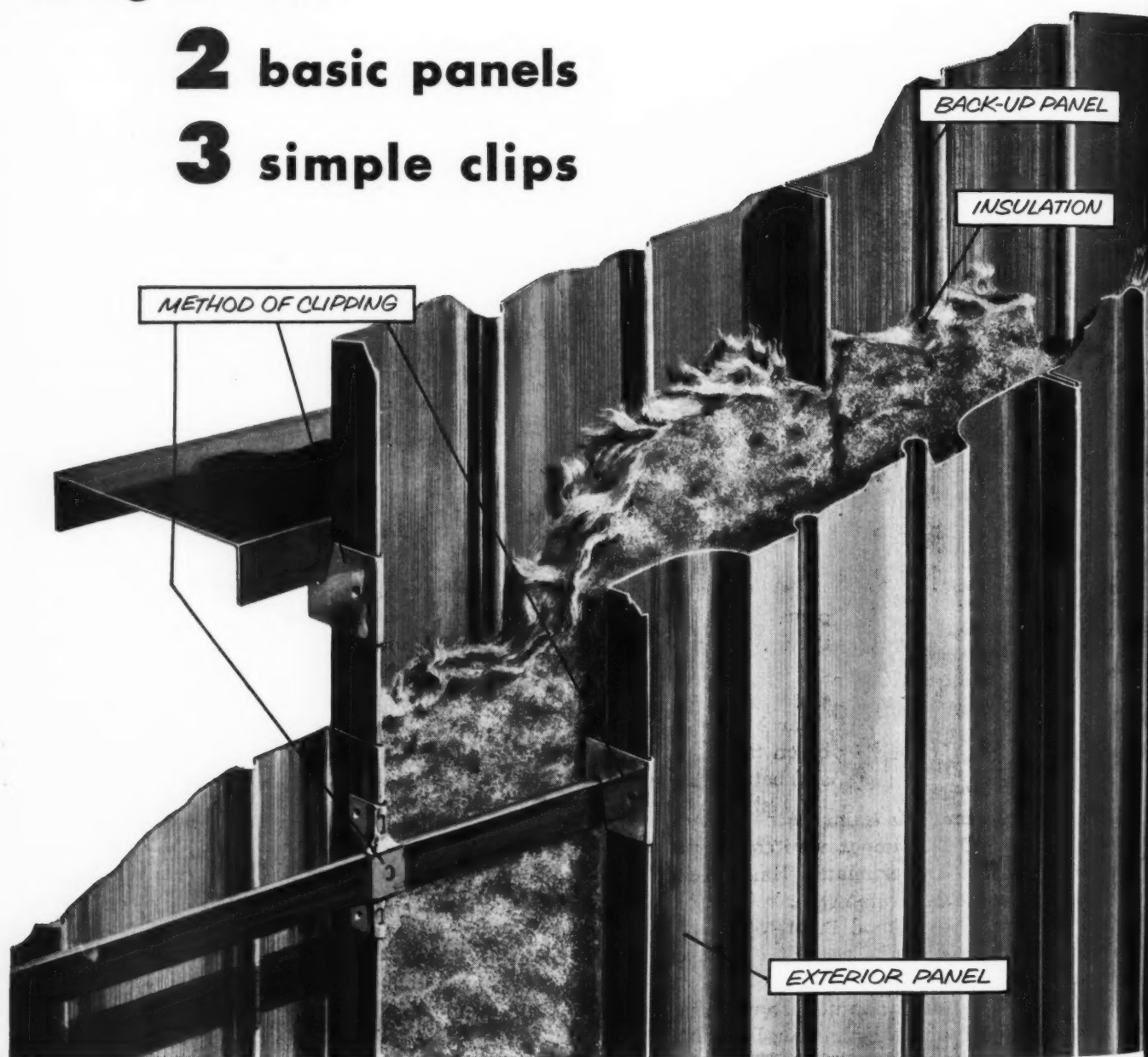
W. P. Monroe, of Sargent & Lundy, has been doing a great deal of equipment inspection at manufacturers' plants. The idea is to make sure that major items of equipment meet the consulting engineer's specifications — and the right time to be sure is while the equipment is still in the manufacturer's hands — before it has been shipped to the project site. He gives valuable suggestions as to how this should be done in his article, "Inspect Equipment Before Shipment."

The new highway program offers a once-in-a-lifetime opportunity to consulting engineers experienced in highway and bridge design. State Highway Departments will be so loaded with work that a great many of them that heretofore have resisted will now be forced to go to independent consulting engineers for design and specifications services. When it is proved that this is the most economical way to get the job done, most of them will change their minds about outside services and make extensive use of consultants. The survey in this issue ("Consultants on the Highway Program") shows the past practices and future plans of the Directors of the State Highway Departments with reference to the use of consulting engineers. It also shows their different attitudes toward engaging outside engineering help to supplement the work of their regular employees. It simply does not make sense for Highway Departments to enlarge their engineering staffs with civil service employees, who will then be on the government payrolls for life, when the work can be done cheaper and better by consulting firms on a contract basis.

How accurately can you estimate the cost of drafting work before starting on a new project? This important item of cost is too often missed by a wide margin in preliminary estimates. Harry Terry, of New York, has found a way to make more accurate estimates based on a statistical analysis of completed projects. The method involves several hours of work to establish a formula that applies to the type of work generally handled by a particular engineering firm, but once the formula is established, applying it to a proposed project takes a matter of minutes. To make your estimates more accurate, try the method described in "Estimating Drafting Costs."

It may be possible to "beat the Dutch" in some fields, but not in building dikes. They have been losing land to the sea and then reclaiming it since the beginning of the Christian era. They are now just about even with nature in acres gained and acres given up. In a few more years they propose to get ahead for the first time in over a thousand years. It is the greatest engineering project underway today, and it ranks among the engineering wonders of the world, ancient or modern. The article in this issue on the reclamation work of the Netherlands is a staff prepared article, and any inconsistencies in spelling must be blamed on too much research in books that make regular reference to "pumping" stations, "keileemkraans," "baggermolens," and all the other equipment that is on der Zuiderzeewerken.

Enclose a complete building
with new **Stran-Satin Curtain**
using **1** tool
2 basic panels
3 simple clips



The new Stran-Steel curtain wall system with exclusive *Stran-Satin* combines a satin-smooth finish, free of spangled patterns, with the protection of a noncorrosive zinc coating. You get the low cost of steel, plus the eye-appeal of far more expensive materials. Stran-Steel curtain wall system consists of two basic panels and has a simple field erection assembly technique. Panels

are never pierced or marred by bolts, screws or rivets. By using special clips and a crimping tool, you get a smooth, leakproof surface. This assembly technique provides a modern method of wall or fascia construction for industrial, commercial, recreational, school, hospital or other public buildings. And buildings go up fast so other trades can begin work sooner.

in Wall System



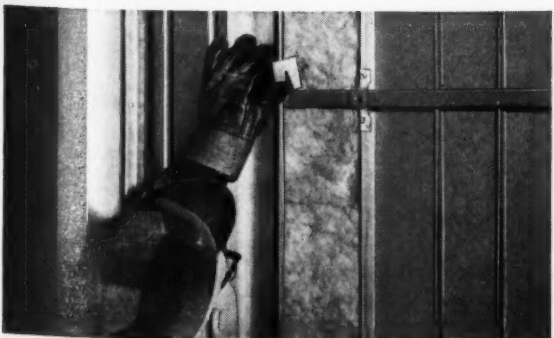
Back-up panel is clipped to horizontal girts of the building's framework. At the joints, the panels overlap and interlock.



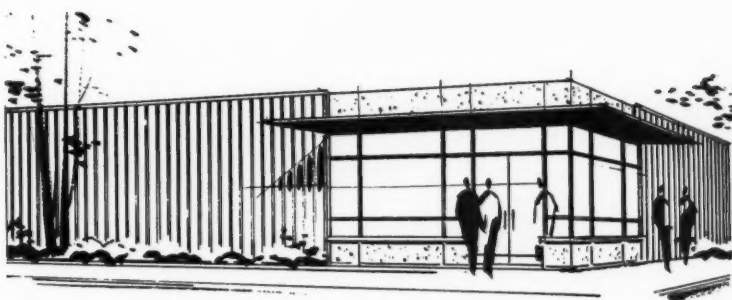
Ten-foot steel bars are clipped horizontally and are on 4-foot centers. The clips are crimped to provide a permanent assembly.



Noncombustible insulation is inserted between the back-up panel and the steel bars.



Exterior panel is clipped to 10-foot bar and crimped in place. Next panel overlaps and covers clip for an unbroken surface.



Stran-Steel curtain wall is a quality product designed to meet strict architectural requirements.

EXTERIOR PANEL

Exterior panel is heavy gage steel with *Stran-Satin* finish. Continuous lengths up to 54 feet can be furnished in three gages—18, 20 or 24.

BACK-UP PANEL

Back-up panel is also available up to 54-foot lengths in three gages with exclusive *Stran-Satin* finish. Offset construction eliminates metal-to-metal contact increasing insulating efficiency and reducing condensation.

INSULATION

Sections are designed for 1½-inch batt-type insulation. With a "U" factor of 0.14, this panel has the insulating efficiency of a 16-inch masonry wall.

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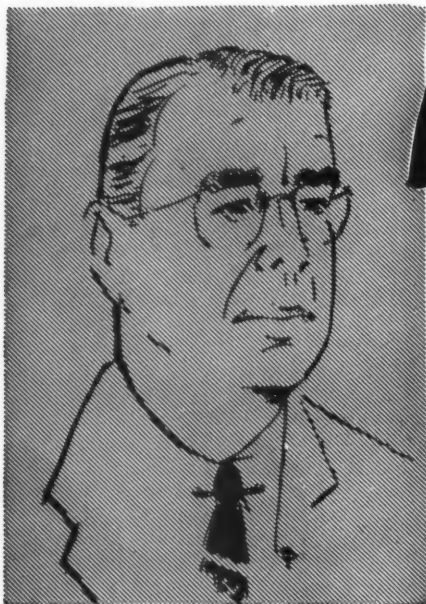
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E. F. MacDonald
INDUSTRIAL ECONOMIST

ECONOMIC News Notes

▷ **SPEECH-OF-THE-MONTH**—Contending that monetary policies by themselves have proven insufficient to control Great Britain's booming economy, Chancellor of the Exchequer Harold Macmillan warns that the U. S. should learn that other measures are necessary. He pointed out in a recent talk in this country that monetary policy has its limitations even when accompanied by high taxation and budget surpluses. In view of this country's commitment to full employment and ever-expanding economy, this is a statement of paramount importance.

▷ **ROSY FORECAST**—"Gradual recovery in housing construction" is forecast in the Associated General Contractors' fall survey. It is expected that the record \$60 billion of outlays for construction this year, including maintenance and repairs, will rise to around \$78 billion annually by 1965. Residential building is seen increasing 26% by 1965 over the 1956 volume—although there will be a further slight decline in 1957. Nonresidential building is expected to increase one-third from this year's \$13 billion total. AGC feels that the estimates signal "even greater expansion programs than those now under way" in steel, cement, and other allied industries.

▷ **BUSY CORNER**—The New York Central plans to construct an office building on the entire block at 277 Park Ave., N.Y.C. Deadline for bids for the ground leasehold is Jan. 15, 1957, and the lessee must begin construction by January 1959 . . . meeting specifications that the building must be at least \$30 million and 30 stories. It will be erected across the street from the 40-story building Union Carbide begins constructing this coming January and up the street from the 46-story, \$75 million building to be constructed by Mr. Vincent Astor.

▷ **VALUABLE TOOL**—A new type of capital spending survey developed by the National Industrial Conference Board and Business Week discloses no soft spots developing in the business investment boom. The new guide to business capital investment shows that at the outset of this year, outstanding uncommitted capital appropriations of the 1000 largest industrial companies

amounted to \$8.2 billion. At mid-year this backlog had mounted to \$10.4 billion—a solid increase of 27%. Unlike the two capital spending series of McGraw-Hill and Commerce-SEC which are based on estimates of planned outlays for plant and equipment, this series is based on appropriations—a step closer to actual spending.

▷ **RECOMMENDED READING**—NSPE has published a 23-page check-list, "Criteria for Professional Employment of Engineers," that goes hand-in-glove with the Engineers Joint Council "Report on Employment Conditions and Professional Standards." The latter has been a "sell-out" and is still available from EJC at 29 West 39th St., NYC. The NSPE booklet may be obtained for 25¢ (discounts on quantity basis) from NSPE, 2029 K St., N.W., Washington, D. C.

▷ **DIXIE REVOLUTION**—The South is undergoing a series of changes so marked as to constitute a revolution of industrial development and market expansion, Mr. W. E. Dillard, president of Central of Georgia Ry., contends. He cites such facts as the location of 17,000 new industries in the southeast since 1939 and the business investment of \$400 million along the right of way of his railroad in just the last four years.

▷ **ILGWU POLICY**—The International Ladies Garment Workers Union is investing \$20 million in the financing of residential building for vets. Representing a new departure in its investment program, 10% of the union's funds invested in Government securities will be switched to VA mortgages.

▷ **JUST BEGINNING**—Stating that an "unbelievably large aggregate of public capital construction is in the works," Mr. George Wanders, editor, The Bond Buyer, contends that the nation is "only at the beginning of a prodigious program of reconstruction and expansion of roads and bridges, schools, water systems, and hundreds of other major facilities."

▷ **THROUGH THE TRANSIT**—While Atlantic and Gulf ports optimistically revise downward the volume of shipping business they may lose after completion of the St. Lawrence Seaway, Great Lakes ports go ahead at full speed with plans for construction of piers, docks, and shipping facilities . . . New York City should spend a minimum of \$1 billion in the next decade, the NYC Board of Education Committee estimates, to meet school construction requirements . . . Steel sees possibility of boost in steel prices in December . . . A \$6 million civic center has been proposed in Baltimore and a 39-acre site has been suggested.



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■ In a hospital there can't be the slightest margin of error. Nowhere else is equipment required to pass such critical tests. Mr. Howard A. Palestine, Manager of Mid-Island Hospital, Bethpage, Long Island, puts it this way: "Like all hospitals, ours operates 24 hours a day, 7 days a week . . . and we do it with the help of such dependable equipment as Kewanee Boilers. It was the reputation which KEWANEE has built up over the years which prompted us to specify that this type of boiler system be used." Rated on nominal capacity, Kewanee Reserve Plus Rated Boilers with 50% extra built-in power, fill normal requirements in stride. Yet, they can be stepped

up instantly to produce additional power needed for emergencies—for fluctuating loads. They provide for expansion too. Here you get "cruising speed" boiler operation with greater efficiency—lower fuel and maintenance costs . . . less stress and strain, plus constant protection against breakdowns and repairs. There's no necessity to operate at full speed all the time. In addition, "cruising speed" operation means you get much longer boiler life. So select Kewanee Reserve Plus Rated Boilers. You can be sure of dependable service, with savings in money too. KEWANEE BOILER DIVISION OF AMERICAN-STANDARD, 101 Franklin Street, Kewanee, Illinois.

SPEED" BOILER OPERATION TEST AT MID-ISLAND HOSPITAL

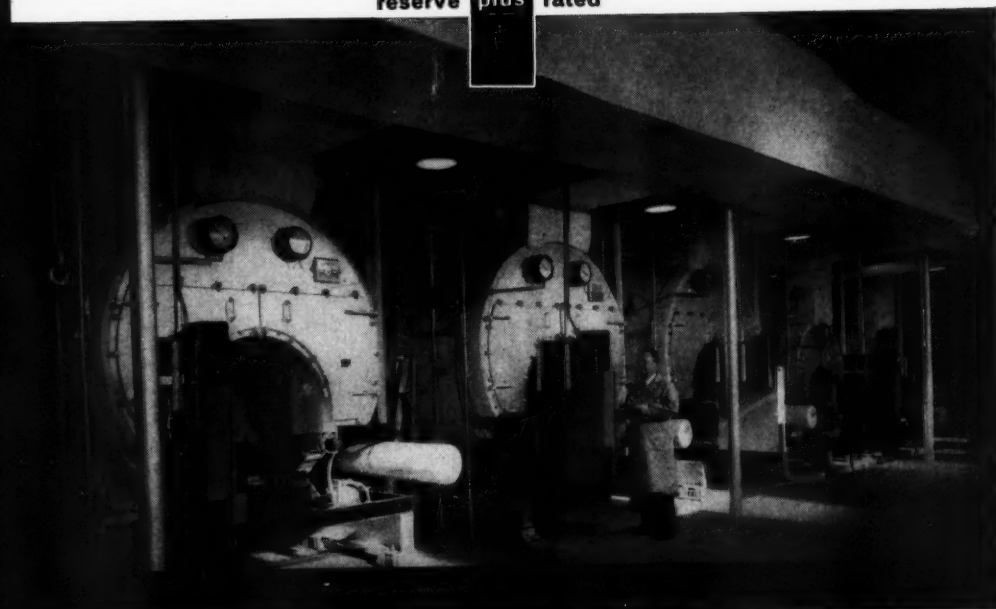


Reception room and admitting desk of Mid-Island Hospital.



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ATOMS IN ACTION

THE CHEMICAL INDUSTRY was urged to more active participation in the atomic energy field by AEC Commissioner Willard Frank Libby at the American Chemical Society meeting in Berkeley, Calif. Pointing out that the only known use for plutonium is in atomic weapons production, and that no nation has developed a method of using plutonium as fuel, he predicted that enormous quantities of the element will be generated by future power reactors since one atom of plutonium-239 is produced by the fission of two uranium-235 atoms when slightly enriched uranium is the fuel. If it were possible to use the plutonium as a fuel also, cost of power would be greatly decreased. Other problems in the chemical field, according to Libby, are chemistry of high temperature systems, corrosion, development of homogenous reactors (called the chemist's reactor), and cheap processing of irradiated fuel elements.

SCIENTISTS of National Carbon Company have developed a technique for "welding" pieces of graphite together. Dr. Robert G. Breckenbridge, director of Union Carbide and Carbon Company's new research laboratories, where the process was perfected, points out that it opens the possibility of prefabricating sheets and panels for assembly of nuclear reactor moderators which now must be built from graphite blocks.

ON HIS RETURN from the World Power Conference, James F. Davenport, vice president and general manager of Southern California Edison Co., voiced the opinion that U. S. electric companies would be unwise to engage in a race for large volumes of atomic kilowatts but should concentrate instead on research and experimentation with relatively small plants, utilizing a variety of nuclear systems to determine those that are both economical and reliable. From papers presented at the Conference, Davenport concluded that other countries, because of lack of fuel, are striving for quantity instead of quality and diversity.

THE MARTIN NUCLEAR DIVISION has announced a new tubular fuel element that is expected to increase the operating power of certain types of reactors by 50 percent while maintaining the same film boiling safety factor. The fuel element is the first of its kind to undergo tests in the high flux hole of the Materials Test Reactor in Idaho.

ALCO PRODUCTS' new nuclear Criticality Facility at Schenectady, N. Y., opened in September, will be used to perform experimental reactor studies to check calculations against actual reactor performance. Early ex-

periments and studies will be in connection with ALCO's contract to build the Army Package Power Reactor—a 2000-kw pressurized water reactor under construction at Fort Belvoir, Va.

THE EXPERIMENTAL REACTOR Babcock & Wilcox Company is assembling in its Lynchburg, Va., critical experiment laboratory will be fueled by fuel elements of uranium-diffused plastic tape, sandwiched between thorium converter plates. This will be the first use of thorium in a reactor.

NEGOTIATION of contract provisions for initial design and development work on the 12,500-kw reactor power plant proposed by the City of Piqua, Ohio, has been authorized by AEC. North American Aviation, which will build the reactor, also holds a AEC contract for design, development, and construction of the Idaho organic moderated reactor experiment. AEC has modified and extended this contract to include development of reactor components including a fuel element for the Piqua project. The Piqua reactor will use circulating organic fluid (hydrocarbon terphenyl) as moderator and coolant, and slightly enriched uranium as fuel.

THE NEWLY FORMED Carolina-Virginia Nuclear Power Associates is working on plans for a multi-million dollar nuclear power facility to produce electricity for commercial distribution. Location, capacity, and type of reactor have not been settled on although the plant will probably be built in either North or South Carolina. Members of the corporation are: Duke Power Co., Charlotte, N. C.; Carolina Power & Light Co., Raleigh, N. C.; South Carolina Electric & Gas Co., Columbia, S. C.; and Virginia Electric & Power Co., Richmond, Va.

ISOTOPE PRODUCTS, Inc. has ordered a 15,000 curie cobalt source from Atomic Energy of Canada for use in an Irradiation Pilot Plant to be built as one stage of a new radiation service for industry. The service will have three aspects: technical assistance on radiation applications; establishment of the \$100,000 Pilot Plant; and design and construction of individual commercial units for production line irradiation techniques. The cobalt source will provide up to one million roentgens per hour of irradiation to a wide range of products of different sizes. Products will be exposed on a conveyor belt system.

GENERAL ELECTRIC has operated successfully delicate electronic components used for control of atomic reactors at high temperatures and in high-intensity nuclear radiation for more than 1000 hours at the Aircraft Nuclear

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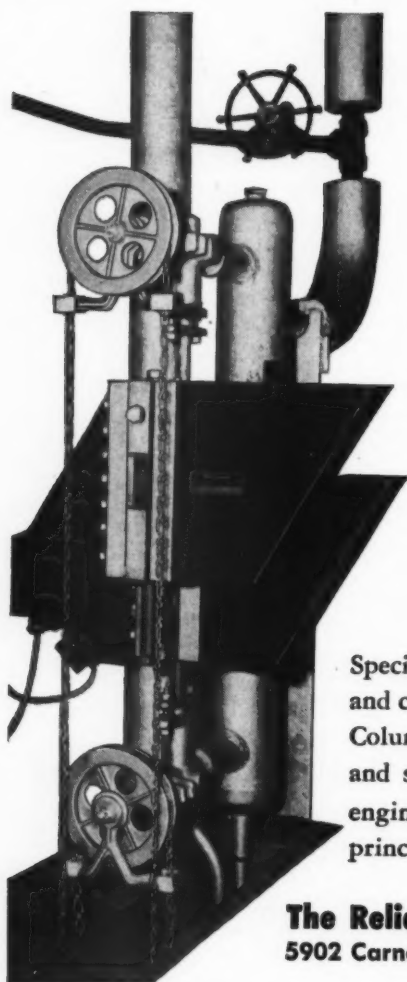
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NOVEMBER 1956

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Specified by many boiler manufacturers and consulting engineers, Reliance Water Columns exceed requirements of national and state code authorities . . . Reliance engineer representatives are located in all principal cities. Write for Bulletin 516.

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Propulsion Department. Assemblies under test, a multi-vibrator and a cathode follower, have been subjected to 90 percent reactor radiation and to temperatures up to 842 F inside an Oak Ridge National Laboratory graphite reactor. The tests are part of ANPD's development work on nuclear power plants for aircraft under contract with AEC and the Air Force. The Department also has constructed a motor of radiation-resistant materials that has been run at 932 F for 50 hours.

INDUSTRIAL REACTOR LABORATORIES, Inc.,

a group made up of ten industrial firms, has announced plans to build and operate a research reactor and associated laboratories at Plainsboro, N. J. The reactor will be a 5000-kw swimming pool type and is estimated to cost about \$1.5-2 million. Participating companies are Atlas Powder Co., AMF Atomics, Inc., American Tobacco Co., Continental Can Co., Corning Glass Works, National Distillers Products Corp., National Lead Co., Radio Corp. of America, Socony Mobil Oil Co., and U. S. Rubber Co.

OVER-ALL DESIGN, development, and construction of the 134,000-kw nuclear power plant that Yankee Atomic Electric Co. plans to build near Rowe, Mass., will be handled jointly by Stone & Webster Engineering Corp. and Westinghouse Electric Corp. Yankee recently signed a contract with Westinghouse covering design and development of the reactor.

UNDER CONSIDERATION by Westinghouse Electric is a site in Churchill Borough near Pittsburgh for a radiation center to include a 1000-thermal-kw modified CP-5 type heavy water research reactor, a 6-mev Van de Graaff accelerator, and radiation laboratories.

THE ATOMIC INDUSTRIAL FORUM

will conduct a survey of manpower employed and required for privately supported atomic energy activities in the U. S. for AEC. The survey is the first in a four-part study, the other three phases to cover manpower requirements of government, universities, and industrial contractors to government agencies.

FISSION PRODUCTS and separated fission isotopes cannot be considered as practical industrial sources in the immediate future, according to Richard Jeppson, president of Applied Radiation Corp. He pointed out that to make one megacurie source of cesium-137 with a 33-year half-life —

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which would sterilize about one ton of food per hour—would require burn

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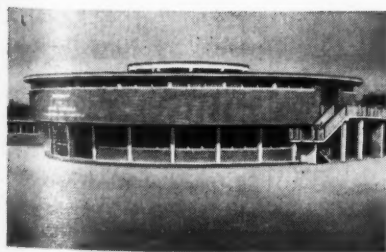
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Specify RECO



New field house at University of South Carolina—
part of huge expansion program.

Hottest thing on S. C. Campus...Hot Water by RECO!

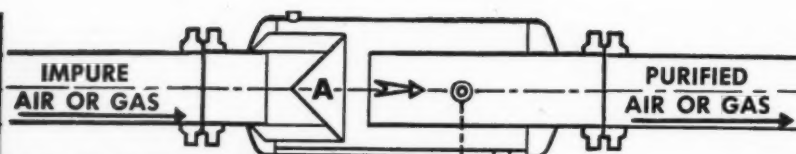
Last fall, 15 new RECO Hot Water Storage Heaters came to the University of South Carolina. They are the second generation of RECO heat exchangers to assure rust-free hot water for campus buildings. Since 1936, RECO has had a record of top performance with low maintenance at USC.

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RICHMOND ENGINEERING CO., INC.

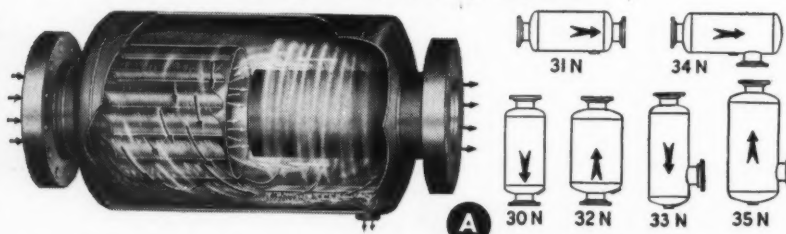


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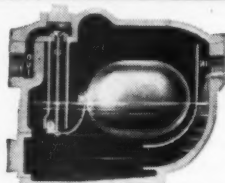
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Where pipe lines carry compressed air and gas, liquids and solids are generally entrained in the gas stream. Wright-Austin 30N Series Separators can be used to remove foreign matter on a wide range of applications. For operating pressures to 5000 PSIG. Line sizes to 24". Here are some typical applications:

- R** —oil and water from compressed air supply lines
- E** —oil and water on compressed air service at outlet of inter-cooler and after-cooler equipment.
- M** —oil, moisture and tar between stages in coke oven gas compressors
- O** —oil and water from CO₂ gas lines
- V** —oil and water from hydro-carbon lines
- E** —entrainment from vapor lines following evaporation



This Wright-Austin separator employs centrifugal force to remove impurities from steam, air or gas flow. The pressure drop is extremely low. Type 31N, as well as other models shown, is light weight, compact and sturdily constructed according to ASME code.



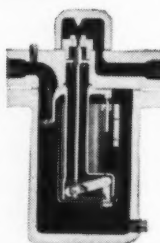
**23-AC
 TRAP**
 (0-125
 PSIG)

Separated condensate flows to trap. Drainage is automatic. Particularly adapted where cold, gummy, emulsified cylinder lubricants make ordinary traps inoperative.

B

Cast steel body, cover and bonnet. Designed for draining condensate where high pressures are involved. Internal mechanism all attached to cover for easy service.

101-AC TRAP
 (0-600 PSIG)



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 506-A**



**WRIGHT-AUSTIN
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3245 WIGHT STREET • DETROIT 7, MICH.

which would sterilize about one ton of food per hour—would require burn-up of 800 lb of uranium.

AEC PUBLISHED in the Federal Register of September 10 a proposed rule under which AEC will waive its statutory rights to inventions or discoveries resulting from use of such materials as source and special nuclear materials, heavy water, and radioactive and stable isotopes.

C. F. NIVEN, Jr., assistant director of the American Meat Institute Foundation, foresees prepacking of fresh meats at the wholesale level on the basis of promising results of tests made by the Foundation on the preservation of meat using a combination of tetracycline antibiotics and high energy radiation.

AN OPEN HEARING on the issuance of the conditional construction permit to Power Reactor Development Co. for construction of the fast breeder power reactor at Lagoona Beach, Mich., has been set for November 13 as a result of petitions by three AFL-CIO unions. The unions asked that the hearing be held to determine if PRDC's permit should be revoked on safety and financial grounds. When announcing the hearing date, AEC also released the Reactor Safeguards Committee's June report in which the group voiced the opinion that there was insufficient information available to give assurance that the reactor could be operated at the Lagoona Beach site without public hazard.

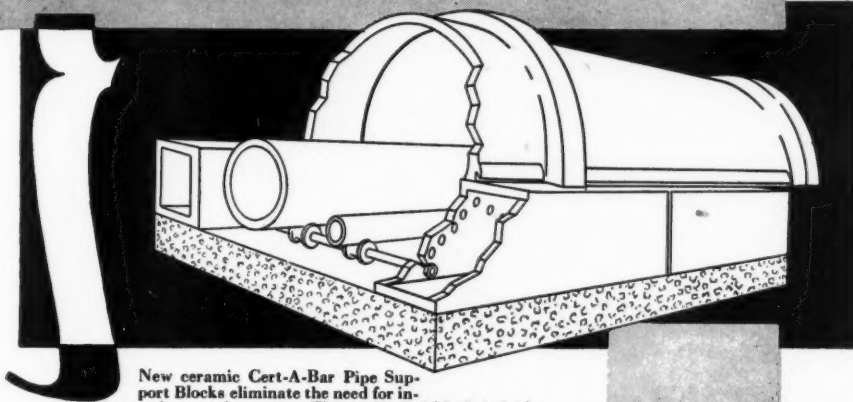
THE 29-MEMBER JAPANESE industrial mission that visited the U.S. under auspices of the Japan Atomic Industrial Forum estimated that by 1965 Japan will require 450,000 electrical kw of atomic power, and that several experimental reactors will be built in Japan in the next five years. One U. S. company has proposed a 20,000-kw boiling water reactor at a cost of \$300 per kw, and Britain has offered a 100,000-kw Calder Hall type reactor at a cost of \$38 million. The Japanese already have on order a CP-5 type research model from AMF Atomic, Inc. and a water boiler research reactor from North American Aviation.

THE MARITIME ADMINISTRATION and AEC have reached agreement on the propulsion system and type of construction for the first nuclear-powered merchant ship. It will be a combination passenger-cargo ship with a service speed of 21 knots, a dead weight of 12,000 tons, and with

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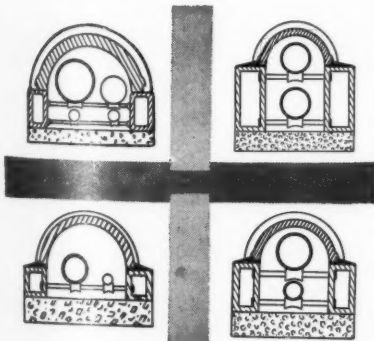
PERMANENT PROTECTION for underground piping!

STILLWATER CERT-A-BAR* TUNNEL CONDUIT SYSTEM



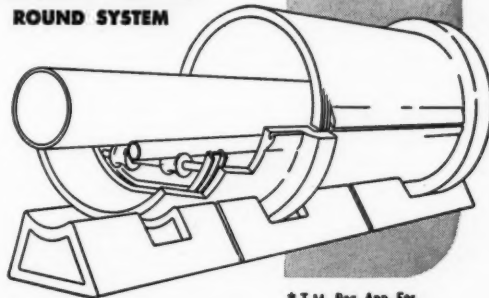
New ceramic Cert-A-Bar Pipe Support Blocks eliminate the need for interior cast iron rests. The perforated block is laid as a structural support member at regular intervals, and the bars are simply inserted and locked in place.

THE vital consideration in selecting an underground conduit system is *permanent* protection . . . not for one year or five, but *for the life of the piping*. You get the best possible protection for your underground metal service piping with a Stillwater Conduit System of vitrified clay. It's chemically inert—can't rust, rot, corrode, or decay . . . ever. And it is manufactured in accordance with ASTM specification C-13-54, assuring proper strength and quality. Any combination of service piping can be protected. Conduit is available in a wide range of sizes, with a complete line of fittings and accessories, including alignment guides, lateral guides, and anchors. Any contractor's crew can handle the installation easily, or if you prefer, Stillwater Licensed Installers will assume the responsibility. The Cert-A-Bar Tunnel System can be installed with any of three suggested new waterproofing specifications—one for average conditions, one for intermittent ground water conditions, and a third for high water table conditions. It's the lowest-cost conduit per year of service that you can specify or install!



A few of the hundreds of possible combinations of piping for the Cert-A-Bar Tunnel System are shown at left. At right is the Lock-A-Bar Round System, used largely for short runs and replacement of other conduit.

LOCK-A-BAR* ROUND SYSTEM



* T.M. Reg. App. For.
Patents Pending.

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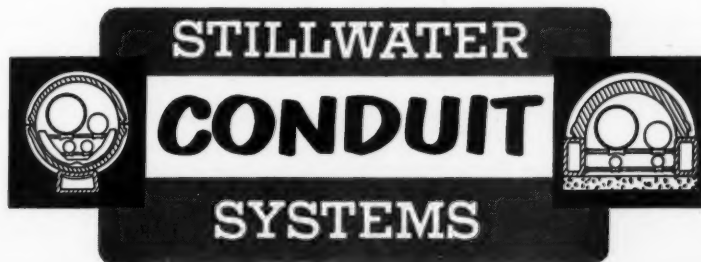
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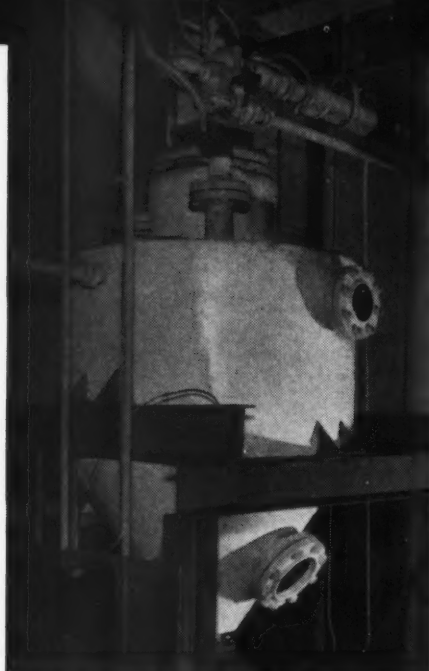
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HEAT INPUTS OF 250,000 BTU/hr to 5,000,000 BTU/hr

The high heat release rate of the THERMAL High Velocity burner used in these submerged combustion installations allows the use of a simple downcomer tube through which the products of combustion are discharged beneath the surface of the liquid. This arrangement is possible because combustion is 90% completed within the burner proper. The THERMAL burner is completely separate from the liquid being heated and maintenance, control and accessibility are greatly simplified. Equally simple arrangements are possible with gas, oil or combination fuel.

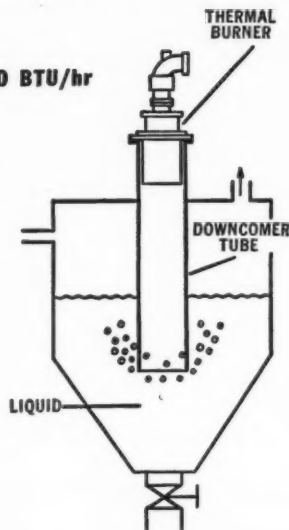
BROAD RANGE OF APPLICATIONS

Depending upon the material being heated either a metal or refractory downcomer tube may be used. Some of the more common applications are pickling baths, acid concentration, caustic soda concentration, aluminum sulphate concentration, water recarbonization, and glass frit and molten salt heating.

OTHER THERMAL PRODUCTS & SERVICES



Gas, Oil & Combination Burners
• Air Heaters • Combustion
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THERMAL

Thermal Research & Engineering Corp.

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room for 100 passengers. The most advanced type of pressurized water reactor will power it. The AEC-MA project includes, in addition, six design feasibility studies on three promising approaches: the gas cooled reactor with closed cycle turbine, the organic moderated and cooled reactor, and the boiling water reactor. Two additional studies are planned for the near future—one on a supercritical water reactor and one on an aqueous homogeneous reactor.

THE 10-THERMAL-KW swimming pool research reactor to be used as an exhibit in Amsterdam's Het Atoom exhibition next June will be built by AMF Atomics, Inc. Similar in type to that displayed by the U. S. in Geneva, it will be dismantled after the show and moved to a permanent location in the Netherlands for use in research and training.

SMALL ENOUGH to fit into any school, industrial, or medical laboratory, the 5-watt water boiler reactor available from North American Aviation is priced at \$55,000. It can be constructed, installed, and be ready to operate in less than six months. Operated on enriched uranyl sulfate in a water solution, the entire reactor is contained in an 8 x 8 ft cylindrical tank.

MINE SAFETY APPLIANCES CO. has hopped on the bandwagon with formation of a new subsidiary, MSA Research Corp., purpose of which is to engage in basic research in the fields of chemistry, physics, and nuclear energy.

CONTINENTAL OIL CO. plans to build a \$500,000 radiation laboratory as part of its research facilities at Ponca City, Okla. Using a radiation source of spent fuel elements, the laboratory experiments will center on development of new products and new and improved refinery processes and petrochemical manufacturing methods.

MINNESOTA Nuclear Operations Group has made a grant of \$65,000 toward construction of a gamma ray facility on the University of Minnesota campus for work in engineering, medicine, biology, and agriculture. The group is composed of utilities, manufacturing companies, banks, and insurance companies.

THE ITALIAN industrial firms of Fiat and Montecatini have formed a jointly owned company known as **SORIN**, for research and development in atomic power.

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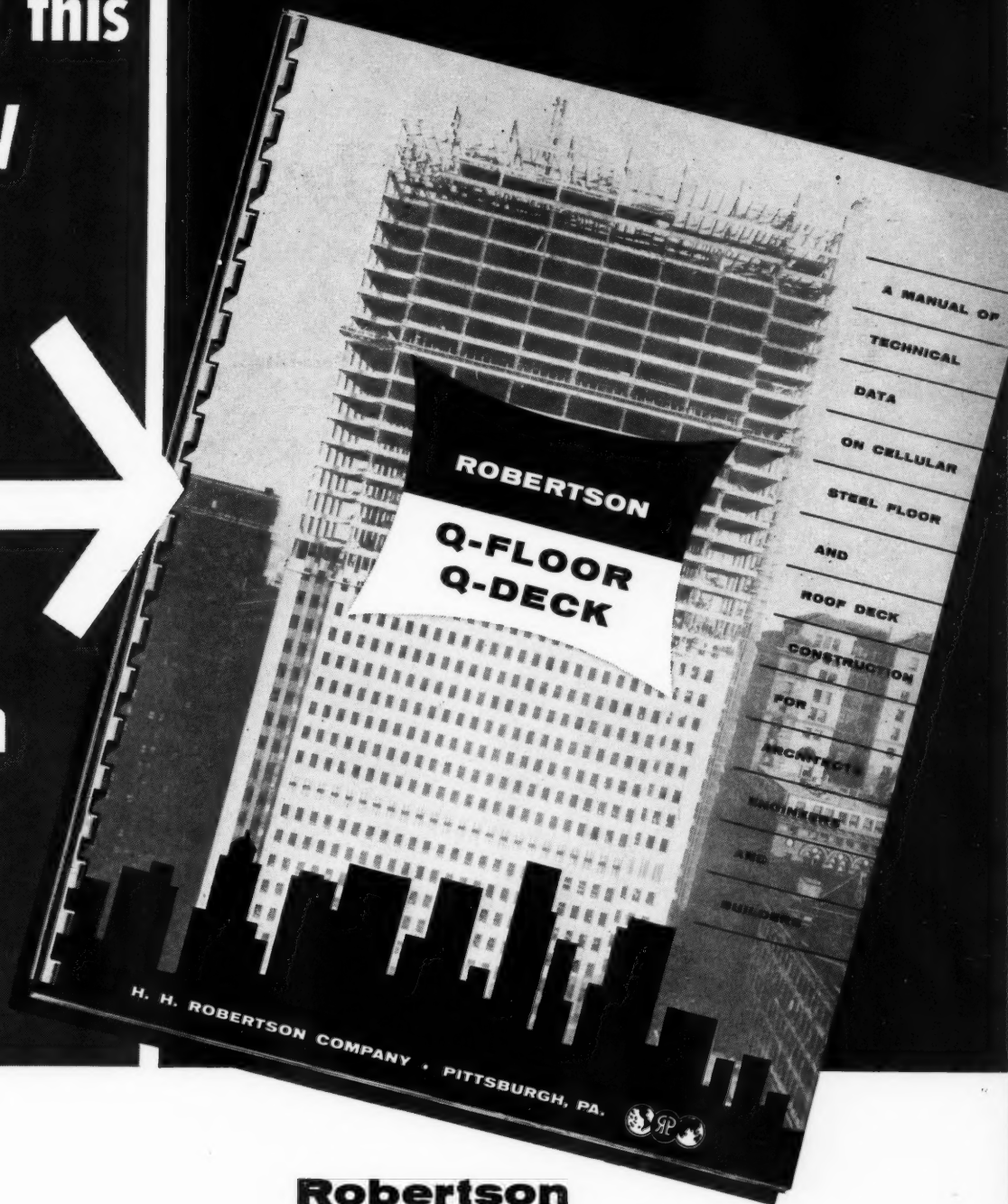
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The Legal Aspect

MELVIN NORD, P.E.

Consultant in Legal and Technical Problems
Patent Attorney

Corporate vs. Partnership Practice (I)

CLASSICALLY, the incentive in our economic system is said to be the profit motive. Critics of our system have condemned it as being the conversion of a human weakness — greed — into a supposed virtue. Nevertheless, the system has worked well because of the early discovery of the theorem that the largest profits can be made, not by “milking” a few customers, but by obtaining many steady customers by offering outstanding quality and service at a fair price.

This, as I have said, is the classical motive of our economic system. Formerly, business and professional men discussed ways of increasing profits. Today, the discussion frequently centers around the expression “tax advantage,” instead of around profits, or service, or quality. Originally, the problem was how to extract money from the public; now the principal problem seems to be how to keep the government from extracting money from you. This is not as easy to ennoble as the profit motive.

A number of engineers are hard at work trying to figure out what type of practice — corporate or partnership — will give them the almighty tax advantage. The purpose of this column is to try to put the problem in perspective so we can get it out of our systems and get back to being engineers instead of tax experts.

Tax Burdens on Corporations

There is no such generalized theorem as to whether or not corporations have tax advantages over partnerships, since: (1) the fact situations differ from case to case and from one time to the next, (2) taxes differ from jurisdiction to jurisdiction, and

(3) tax laws change from year to year. Determining which form of business organization has the tax advantage depends on an engineering-type analysis of the particular facts, coupled with a prognostication of the future. Each case requires separate analysis by a lawyer.

Let us at least list the various types of tax burden which must be considered in such an analysis:

Tax Upon Incorporation

Each state in which an organization is incorporated levies a tax, based on the number of authorized shares of stock. The tax varies considerably from state to state. For small firms this cost is generally small, e. g. for a \$100,000 firm, it might be about \$100.

Annual Franchise Tax

In most instances, a corporation also must pay an annual franchise or license tax to the state of incorporation. This may amount to anything between zero and about \$500 per year for the same \$100,000 corporation.

Privilege Tax in Other States

If a corporation does business in states other than the state of incorporation, generally it is required to pay a tax for this privilege. This is usually at the same rate as the annual franchise tax, but is normally limited to capital actually used in the particular state. To some extent, this may foster double taxation.

Federal Tax

The Federal government collects about \$1.10 per \$1000 of issued stocks or bonds, at the time of issuance. For a \$100,000 issue, this would be about \$110.

Tax on Transfer of Shares

The Federal and the state governments also collect taxes whenever stock is transferred (i.e. sold or given as a gift). For example, the Federal tax is 50 or 60 cents per \$1000 value (depending on the selling price of the stock).

State Property Tax

Normally the state property tax would be the same, regardless of whether the property was solely owned or owned by a corporation or a partnership. However, there is always the possibility that the state may tax the corporation on its total property value, and in addition tax the shareholder on the value of this stock, thus creating double taxation.

State Corporate Income Tax

Most states now have annual income taxes on corporations, a common figure being 3%. While this, like other taxes, is deductible from income as an expense, it is not deductible directly from the Federal corporate income tax. More double taxation.

Federal Corporate Income Tax

The Federal corporate income tax is 30%, and there is an additional surtax of 22% on income in excess of \$25,000. For large corporations, the tax rate is thus about 50%, while for smaller corporations it is 30%. Assuming an income of \$25,000, the tax would be \$7500. This tax is paid before any dividends are distributed to the shareholders, and is paid in addition to the personal income tax of the recipient of the dividends—more double taxation. If the corporation does not earn any profits, i.e. if the owners draw all the earnings out as interest on loans to the corporation or as salaries, there will be no corporate income tax to pay, thus eliminating this double taxation. However, there is a limit to the salary that properly can be withdrawn for this purpose. And if the corporation is saddled with large debts owed to its owners, credit managers will be unwilling to advance credit to the corporation.

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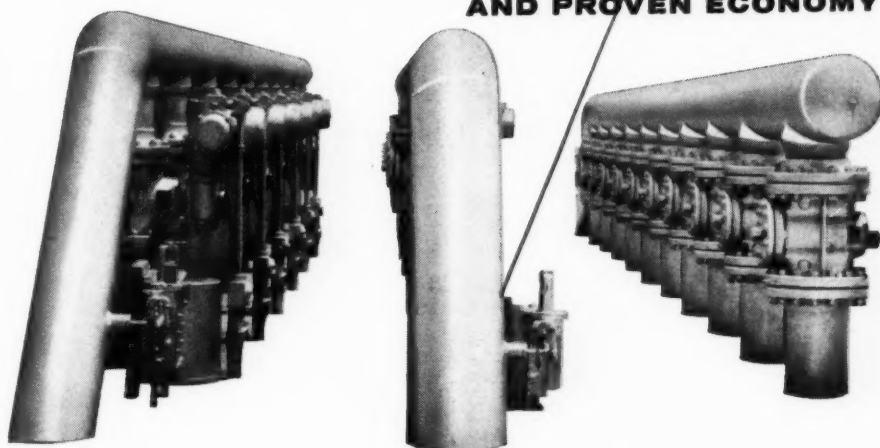
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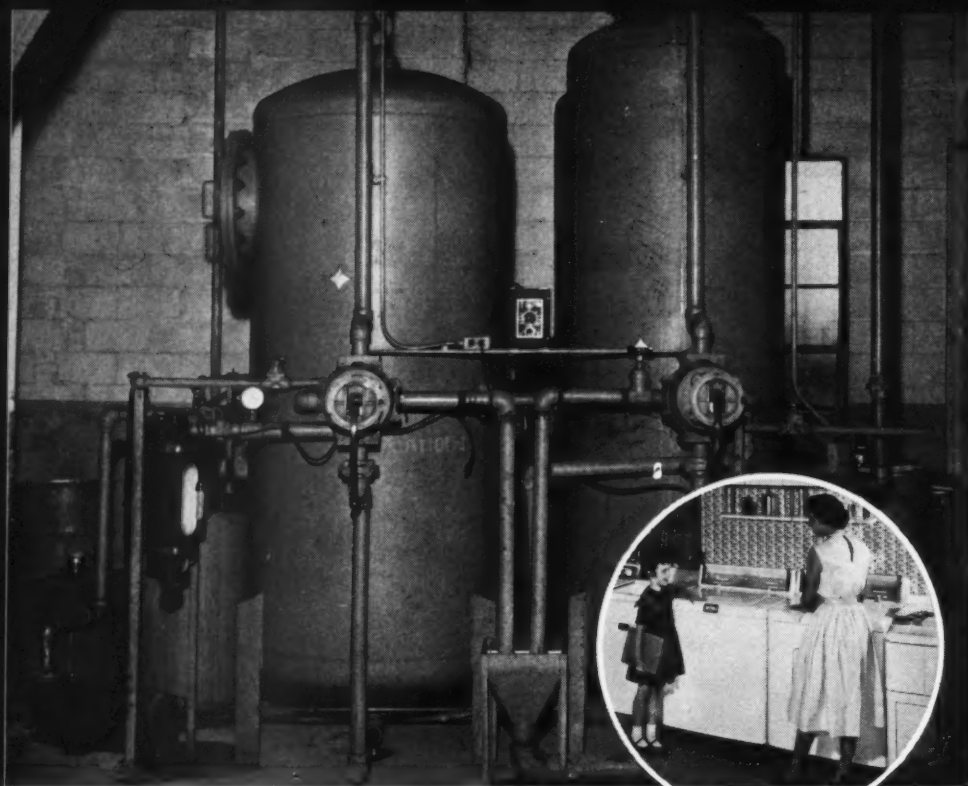


Are you effecting this economy for your company? Neat and uniform appearance is evident in code constructed weldolet headers in this crude oil pipeline terminal. The money saved is in the bank and does not appear in this picture. If you are not using the weldolet method of cutting piping costs, write today for information.

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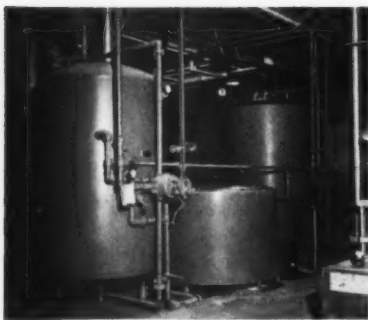
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Industrial Demineralizers help produce flawless finish for Whirlpool-Seeger

A good sales talk is backed by practical chemical engineering. The gleaming synthetic enamel and porcelain finishes on RCA WHIRLPOOL Washers and Dryers are sprayed and baked on metal parts that are prepared for finishing in chemical and steam baths and then rinsed in water. Rinse water is a critical factor . . . even the finest drinking water can leave salt spots that cause finishes to crack and chip. Whirlpool-Seeger engineers have a minimum of rinsing troubles. They use the Industrial Demineralizers pictured above to obtain rinse water as pure as commercially distilled water. Result: A beautiful, lasting finish coat with virtually no rejects due to salt spots.

The picture below shows another Industrial installation at Whirlpool-Seeger, a dual-softener for supplying soft water to the plant boilers. It cuts maintenance costs by preventing scale and thus gives a better heat transfer. The company has four Industrial installations, each designed to do a specific task . . . each has been a profitable investment.



Industrial matches equipment exactly to the job, treating every installation as a unique problem, with complete chemical analysis and survey of methods and materials. This objective engineering produces equipment that becomes a real asset to your company—a tool for quality-control and greater output. If you will outline how you use water in processing, we will be glad to make recommendations and estimates.

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Industrial

Corporate Accumulation of Income

On the other hand, if the owners of the corporation seek to avoid double taxation by leaving the profit in the corporation instead of taking it out in the form of dividends (thus minimizing their personal income), the corporation will be subjected to an accumulated taxable income of 27½% on the first \$100,000 and 38½% on the remainder. This tax was levied specifically to prevent evasion of double taxation.

Social Security Tax

Corporate officers are employees of the corporation and must pay social security tax. This is deductible from the corporate income, but not from the corporate tax. However, this tax is offset by the self-employment tax on individuals or members of partnership firms, which amounts to a maximum of \$126 per person.

Corporations vs Partnerships

Except to the extent indicated above, all of these taxes fall on corporations, but not on partnerships. Corporations are regarded by the legislatures as "sitting ducks" for taxation, and if any new types of taxes are invented, it is reasonable to assume that they will be levied against corporations (as they were during World War II, e.g. the excess profits tax). Thus, the general view of lawyers is that the corporate form of business should not be used by a small business, unless there is some compensating advantage (such as limited liability and the ability to raise large amounts of capital) to offset the tax burdens on corporations. It used to be that one could keep the profits in the business, and thus minimize one's personal income, but that dodge has been cut off by the introduction of the accumulated corporate income tax.

At present, the only tax advantage of incorporation is the possibility of making a capital gain through increase in the value of the stock. If the stock is held for

A Small Plant Modernizes with **DETROIT STOKER**

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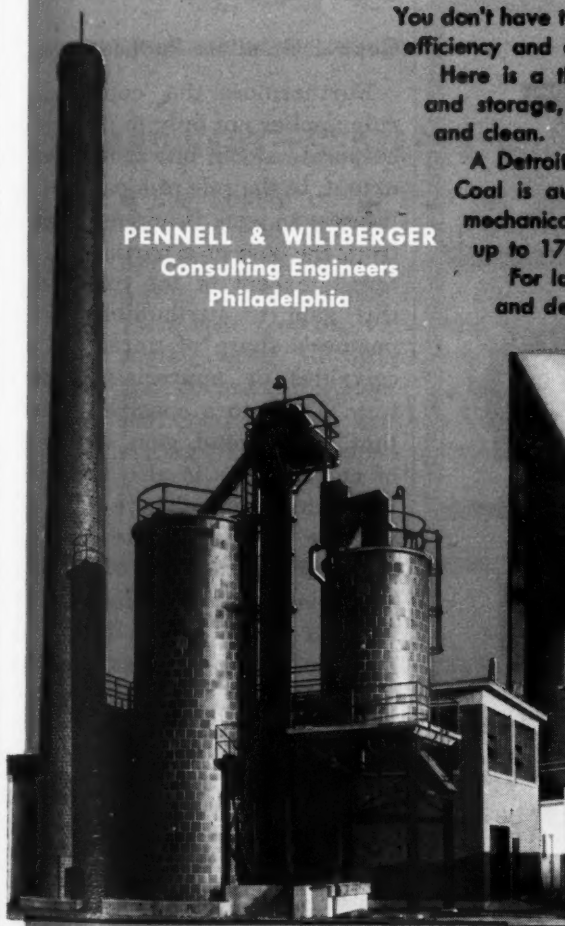
You don't have to have a giant plant to benefit from modernization, high efficiency and dependability of Detroit Stokers.

Here is a thoroughly up-to-date plant. Boiler, stoker, coal handling and storage, and ash handling are all modern, mechanized, efficient and clean.

A Detroit UniStoker fires a 200 horse power Keeler Type CP Boiler. Coal is automatically delivered to the stoker from a silo. Ashes are mechanically removed and stored. No shoveling—no dirt. Boiler operates up to 175% of normal rating at 125 p.s.i.

For large or small plants, Detroit Stokers provide modern, economical and dependable operation.

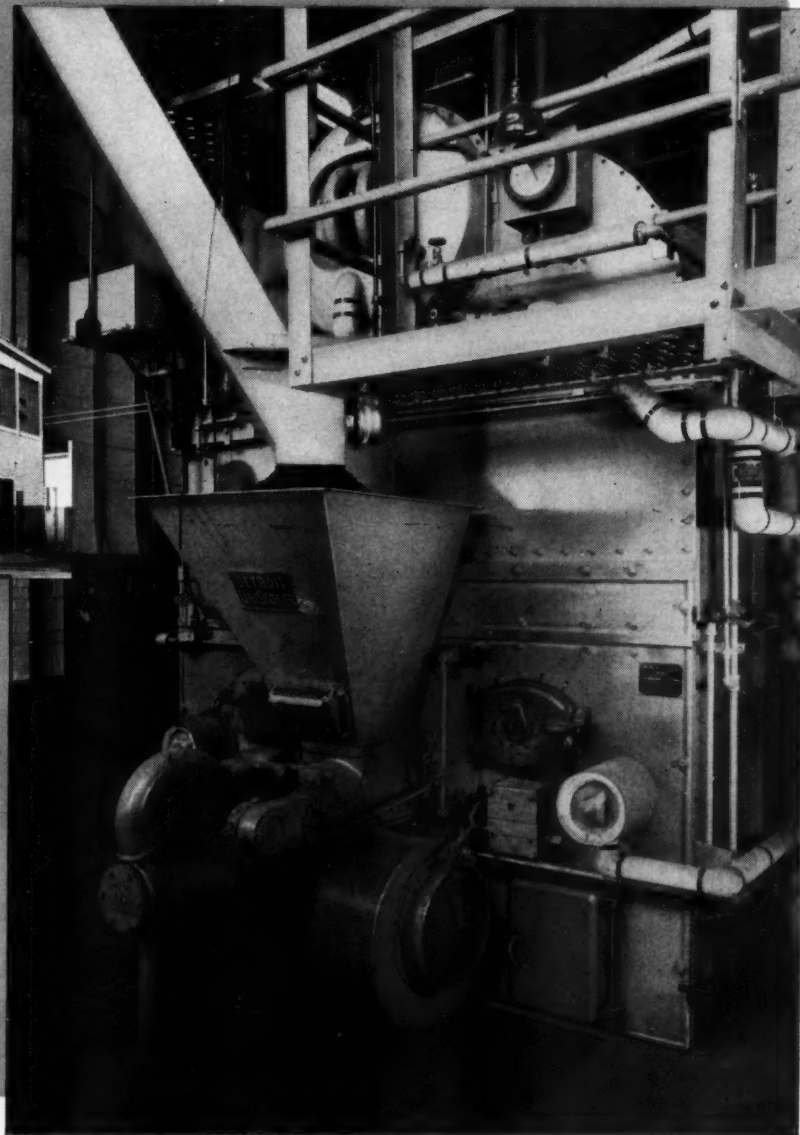
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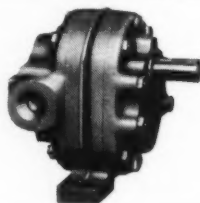


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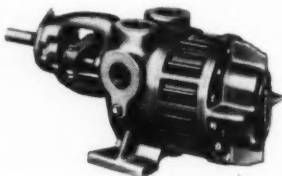
ROPER PUMP-MOTORS

These units offer low-speed and high-torque, and their versatility finds them well-suited to heavy-duty service within their operating range. In general, recommended speed is 200 to 800 R.P.M. with pressures to 800 P.S.I. In this range, they require from 7 to 40 G.P.M. flow and will develop up to 11.5 H.P. output at maximum speed and pressure.



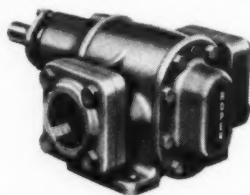
ROPER SERIES F PUMPS

Among the dependable Ropers is the Series F Pump — pressures to 300 P.S.I., sizes 1 to 300 G.P.M. It features four-port design with 8 optional piping arrangements . . . supplied in standard fitted models. With packed box or mechanical seal; with or without relief valve.



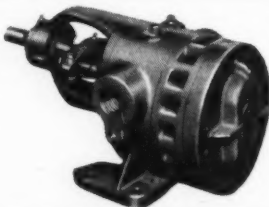
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Operate your hydraulic circuit with the correct size Roper for the particular job. In many cases the Series K will do, for it is rated from pressures to 150 P.S.I., capacities $\frac{1}{4}$ to 50 G.P.M. This model is compact, sturdy . . . is self-lubricated by liquid pumped. Comes with packed box or mechanical seal . . . with or without relief valve.



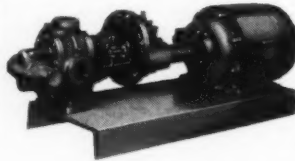
ROPER SERIES H PUMPS

Lower maintenance costs with a Roper. For instance, a pump like the Series H with pressures to 1000 P.S.I., sizes 10 to 75 G.P.M. is ideally suited for hydraulic mechanisms and for other applications requiring high pressures. Spur gears run in axial hydraulic balance . . . roller bearings and bronze wear plates reduce friction. Available with packed box or mechanical seal.



ROPER SERIES 3600 PUMPS

You'll profit more with dependable Roper Series 3600 Pumps on the job . . . they are speedy, quiet, and plenty rugged. Service-proved features such as self-lubrication, adjustable relief valve, hardened gears, and mechanical seal contribute to Roper dependability. Sizes range from 40 to 300 G.P.M.; pressures to 60 P.S.I.



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Rotary Pumps

at least six months and then is sold at a profit, the maximum tax rate is 25% for such profit, i.e. it will be 25% or the regular income tax rate, whichever is lower. This is probably the advantage most people are thinking of when they assume that corporate practice is desirable tax wise. However, the 25% rate is no improvement until the total income reaches \$36,000 (for a joint return) and therefore is not very helpful to engineers.

Capital Gains for Partners

Furthermore, the "capital gain" rule applies not only to the sale of corporate stock, but also, to some extent, to the sale of a partnership interest as well. It applies to gains from the sale of a partnership interest, except to the extent that this gain is attributable to the partner's share of unrealized receivables or appreciated inventory. Thus, to a considerable extent, the capital gain advantage of corporations is also applicable to partnerships. There is no advantage whatever unless the individual (shareholder or partner) sells his interest in the firm. So long as he continues practicing, there is no tax advantage to him on the basis of a capital gain.

Legislative Action

Although there is no general rule that fits every case, it is difficult to understand why engineers should be so enamored with the supposed tax advantage of incorporation. On the other hand, there is a distinct movement afoot by legislatures to tax unincorporated associations (including partnerships) as if they were corporations, in order to eliminate the tax advantages of not being incorporated. In the case of ordinary engineering practice, it would not be wise to organize one's firm solely on the basis of a tax advantage.

The Principal Problem

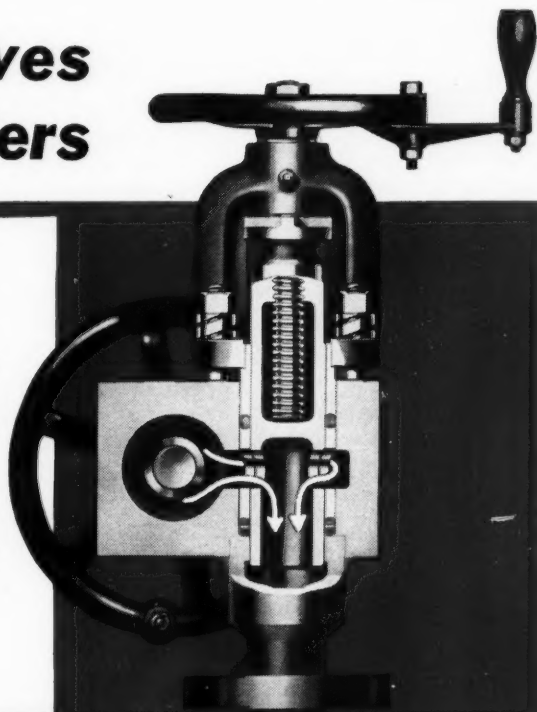
The more emphasis we place on tax advantage and the less we place on doing a good and useful job, the more play we give to the

UNIT TANDEM

**rugged blow-off valves
for high pressure boilers**

HARD-SEAT—SEATLESS COMBINATION

■ For boilers up to 1500 psi, this Yarway Unit Tandem Blow-Off Valve offers the maximum in dependable service. A one-piece forged steel block serves as the common body for the Yarway Stellite Hard-seat blowing valve and the Yarway Seatless sealing valve. All interconnecting flanges, bolts and gaskets are eliminated. The Unit Tandem at right is sectioned through Seatless Valve to show balanced sliding plunger in open position and free flow.



HARD-SEAT—HARD-SEAT COMBINATION

■ For boilers to 2500 psi, this is the valve to use—Yarway's Unit Tandem Hard-seat—Hard-seat combination. Disc has welded-in stellite facing and inlet nozzle has integral welded-in heavy stellite seat, providing smooth, hard-wearing surface.

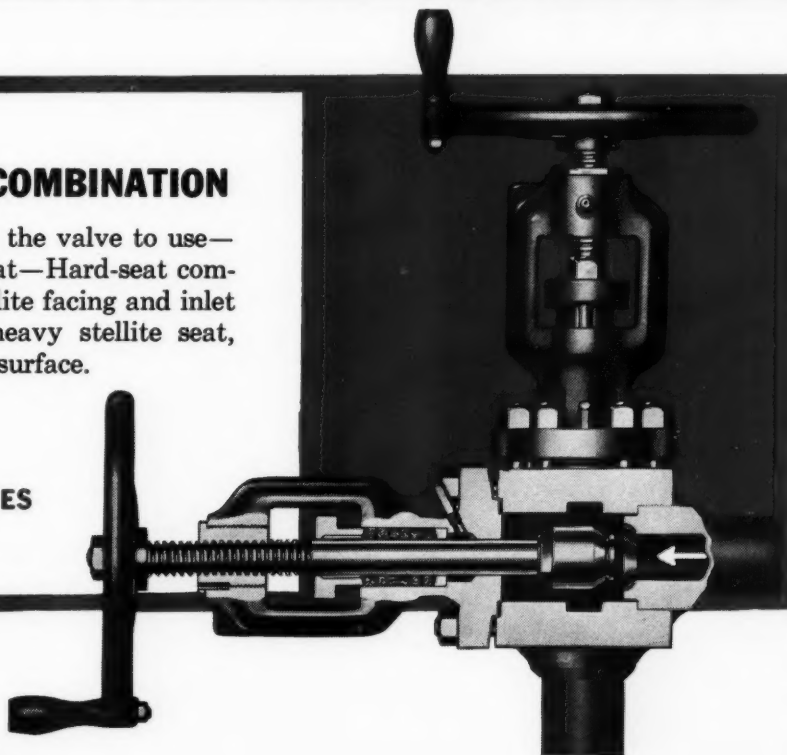
**OVER 4 OUT OF 5
HIGH PRESSURE PLANTS
USE YARWAY BLOW-OFF VALVES**

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BRANCH OFFICES IN PRINCIPAL CITIES

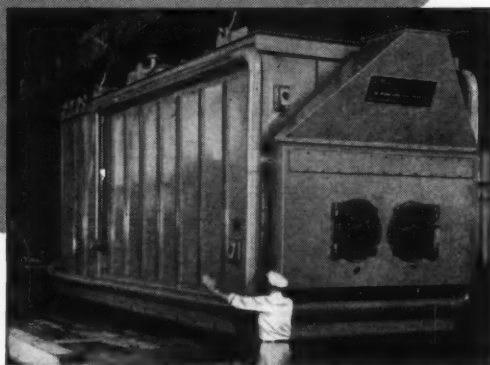
YARWAY

BLOW-OFF VALVES



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human weakness of cupidity and the less we give to human virtues. This is not to argue that we should ignore tax problems. That would be as foolish as putting money into a pocket with a hole in it. The point is, however, that we are likely to lose our balance if we are always worrying about the outgo and lose track of the income. The balanced economic incentive is to maximize retained earnings. This does not necessarily involve minimizing tax outgo.

There is no point to reducing outgo if you have to reduce income to do so. And to the extent that mental effort is spent on the problem of tax advantages, it detracts from the principal problem of doing a good job and keeping income at the highest possible point. In other words, to state it in the form of a proverb that has not yet been invented, "He who worries about how to keep from paying any taxes will succeed."

In the next column in this series, we shall take a look at the factors other than taxes which should be considered in determining whether or not to use a corporation or a partnership form when organizing a firm.

ARTICLE REPRINTS

For free copies of reprints listed below, write on company letterhead to Reader Service Dept.,

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- "Repairing the James River Bridge System"
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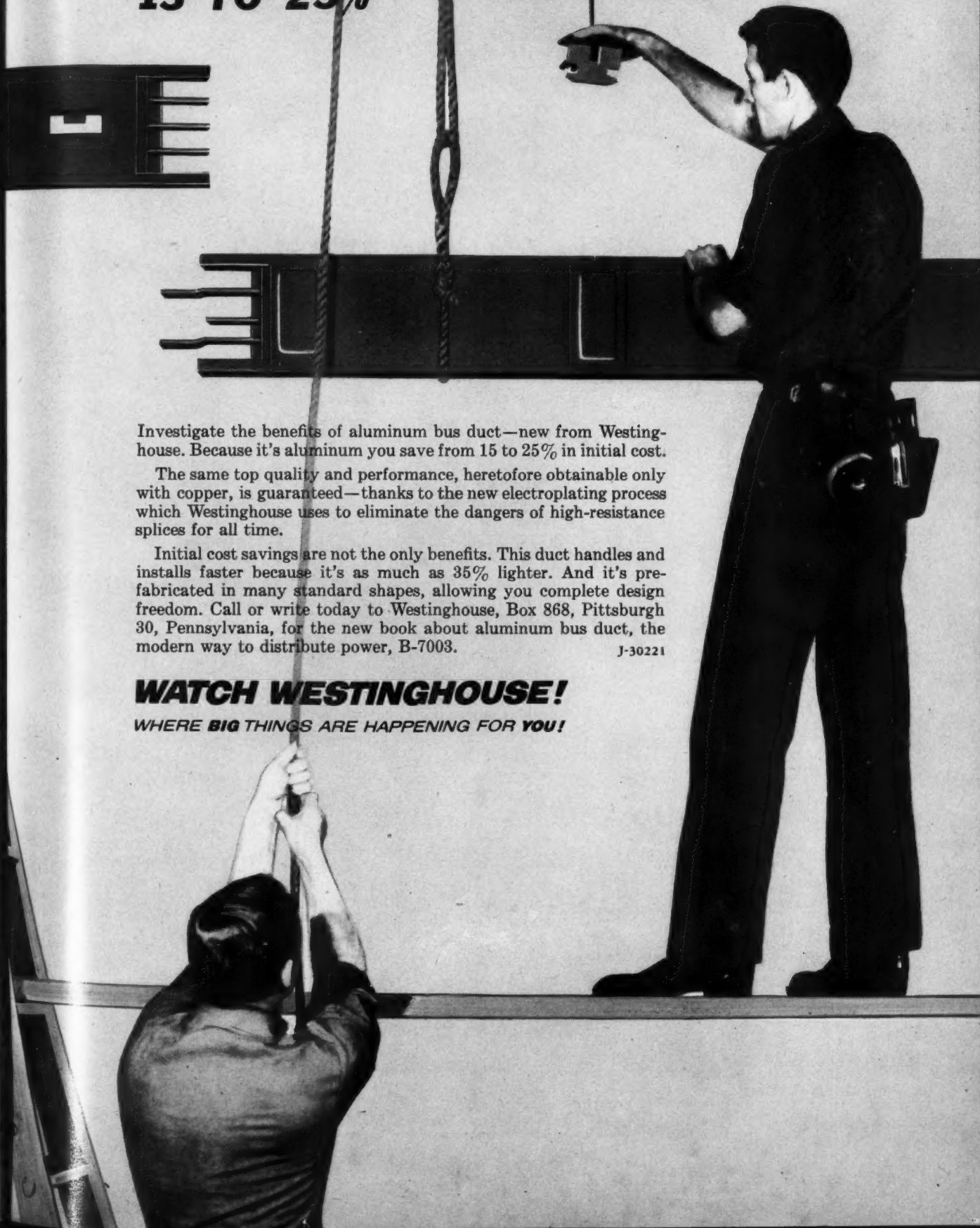
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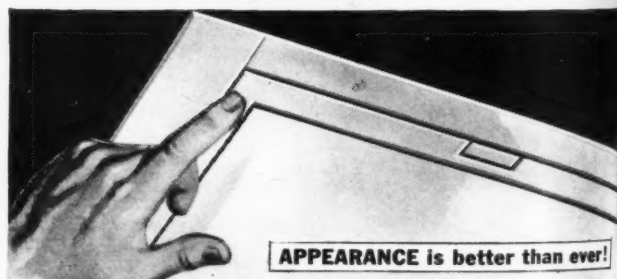
Look what happens when **BENJAMIN**



Look what happens when you specify **BENJAMIN** Troffer Lighting

Things really start to happen when you specify money-saving, new Benjamin Troffers. Lighting maintenance expense is cut. Low-ceilinged rooms get a new improved light treatment. Annoying glare is banished. There's a brand new freedom of architectural expression and lighting layout. Shown here are a few of the advanced Benjamin features that help to make all this happen at the lowest possible cost per year. Investigate Benjamin Troffer Lighting for schools, stores, offices and factories... all things considered they're the Better Lighting Choice.

BENJAMIN ELECTRIC MFG. CO., DES PLAINES, ILLINOIS
Sold Exclusively Through Electrical Distributors.



APPEARANCE is better than ever!

Greater ceiling beauty can happen to any room with the slim, trim design of Benjamin Troffers. A seamless frame, which shows no visible marks where the cover is joined, and concealed latches and hinges, make possible smooth, uninterrupted lines.



TROFFER SELECTION is greater than ever!

There's no need to compromise size, style or type of installation when you specify Benjamin Troffers! Any architectural effect you desire can be made to happen with this wide

choice: 12" and 24" widths; 4' and 8' lengths; 2' x 2' for fill-ins; wide range of glass and plastic covers or louvers; six different mounting styles.

RELAMPING is easier than ever!

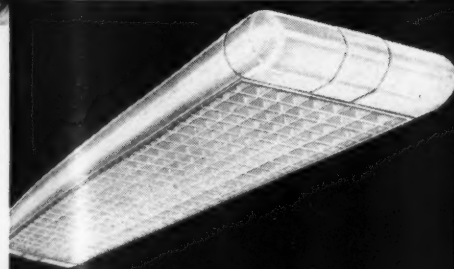
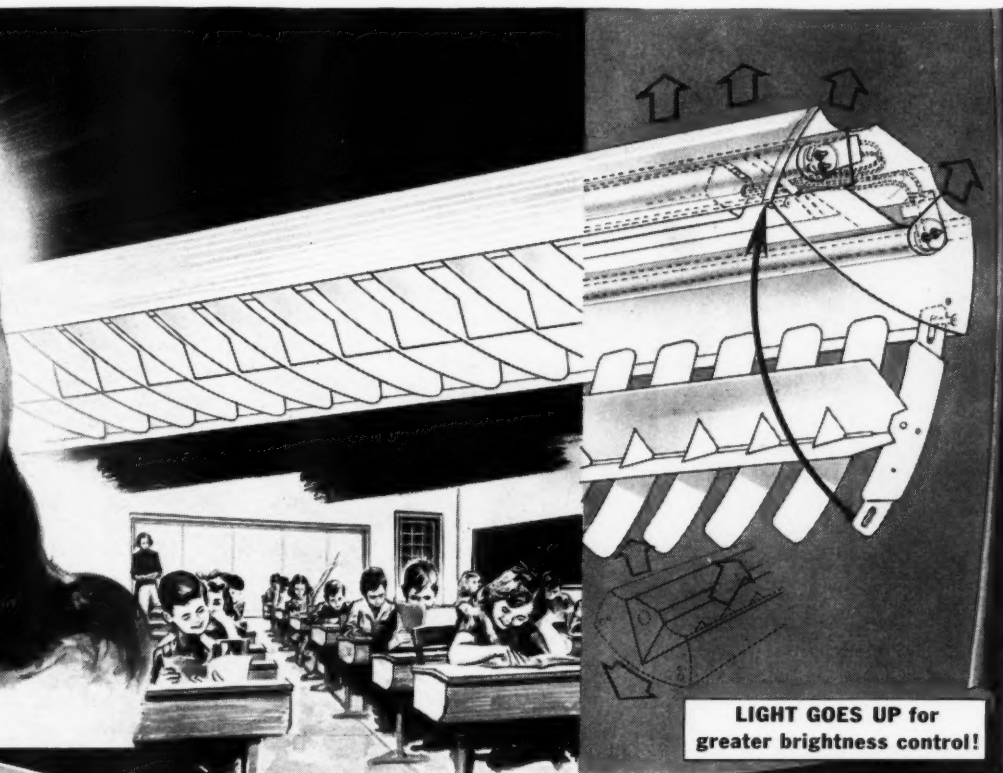
Here's the newest that's happened to speed up relamping and all-around servicing. It's the Benjamin DeLuxe Concealed Latch, standard on glass-enclosed troffers. Just a fingertip touch opens the cover...closes by simply snapping shut. Requires no tools...never needs servicing.



N LIGHTING goes to School!



Lots of things happen when you specify Benjamin for school lighting. There's a new freedom of choice which leads to best possible new lighting and relighting results. You get a wide range of opportunity—such as Troffers, Varsity, Officer or Corri-lite—to meet school budget requirements. And, when installed, Benjamin school lighting units provide reduced maintenance and operation costs through construction advantages like those shown here. *Considering all these things, Benjamin School Lighting is your Better Lighting Choice!*



VARSITY fluorescent units represent a sure way to keep initial cost down without sacrificing lighting quality. Look what happens: Visual comfort is increased through translucent plastic side panels combined with 40% upward light. Cleaning is a chore no more because of hinged louvers designed for minimum collection of dirt.

OFFICER units feature the slimmest, trimmest appearance that ever happened to a classroom! In addition, however, they feature extra rigid construction provided by one-piece moulded louvers, and rugged, extruded plastic side panels.

CORRI-LITE solves hall-lighting problems with fewer fixtures! Unique baffle-design provides smart appearance plus correct shielding at a truly economical price.



BENJAMIN SCHOOL LIGHTING UNITS

Notes FROM ABROAD



Power—From Mine to Line

Burns and Roe, Inc., consulting engineers and constructors, have been retained by Ford Highwood Collieries, Ltd. to study the economics of mining coal on the Highwood River Valley of Alberta, Canada, and feasibility of building a power generating plant as close to this source of fuel as possible.

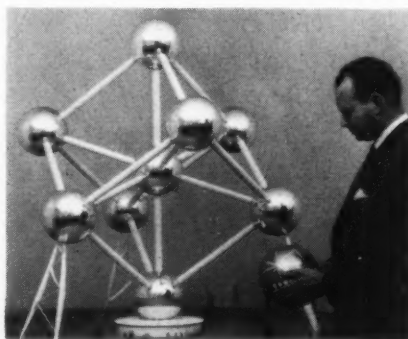
The firm currently is studying the terrain to determine the extent of the coal deposit, and the most advantageous method of mining it. Also being considered is the exact location of the generating plant that will yield the most economic balance between fuel transportation costs and cost of building high-voltage transmission lines. Ford Highwood will deliver generated power to the border, where it will be phased into the transmission lines of Transnorthern Power Corp., an American company. The latter system, in turn, will connect with the Bonneville Power Administration grid, over which the power will go to the ultimate consumers throughout the northwest.

Modeled After Iron Crystal

For their part in the Universal Exhibition to be held in Brussels in 1958, three Belgian metal industries are constructing a huge model of an iron crystal with six of the nine spheres to be used as exhibition halls for the display of atomic energy materials and processes. To be known as the Atomium, the structure will stand 360 ft at its highest point. Each sphere will be 59 ft in diameter and will be connected to its neighbors by tubes 10 ft in diameter fitted with escalators. The vertical axis tubes will carry passen-

gers on a lift designed for 20 persons and traveling at a speed of 16 ft per sec.

The reinforced concrete foundation, a 39 ft diameter circle 6½ ft thick, rests on 59 steel stakes sunk to a depth of 56 ft. Each stake is designed to support 60 tons. In tests the stakes sunk only 0.05 in. with a 50 percent increase over the design weight. The foun-



MODEL OF THE ATOMIUM

dation and the three exterior rigid steel pylons will support a total of 1400 tons.

High tensile steel, H.S. 52, is used for the framework of the spheres and tubes. The aluminum skin of each sphere is composed of 48 triangular elements, each of which is made up of 15 smaller triangular parts. The skins are fitted on U-shaped girders with rubber and plastic joints to permit movement. The external aluminum is being treated by the electrolytic brilliance process. Large bay windows and smaller, decorative elliptical windows will be installed.

Foundations have been laid and the first sphere, at the base of the structure, is in place. Next spring the remaining spheres and connecting tubes will be assembled

at the ground level and hoisted into place.

Initial plans to use the spheres for exhibits of Belgian science projects have been revised and the space is now being rented. The top three will be used as a champagne room, a restaurant, and a cafe bar. In the top of the highest sphere a television and radio station will be installed.

Other spheres will be devoted to exhibitions of peaceful uses of atomic energy. One has been rented by the Soviet Union, which intends to install the small swimming-pool reactor displayed at Geneva. The Belgium government and France have each rented a sphere also.

Creator of the Atomium is A. Waterkeyn, Civil Engineer and Manager of the Federation of Belgian Metal Industries (Fabrimetal), one of the three sponsors of the project. The other two are the Belgian Group of Blast Furnaces and Steel Plants and the Union of Non-Ferrous Metals.

A. Beckers and A. Joukoff are the consulting engineers, and A. and F. Polak are the architects.

International Shopping

An interesting solution to the shortage of engineering graduates in the U. S. has been proposed by Cesar Jayme, assistant manager of Northwest Orient Airlines' office in Manila. In 1949 NWA promoted a program to send Philippine doctors and nurses to the States to alleviate the shortage of medically trained personnel. Although originally a plan to boost airline travel via NWA, the program aroused national interest. Since its inception, almost 400 Philippine doctors and nurses have worked in the U. S. under the exchange visitors program.

To test the availability of engineers to work in the States under the same sort of arrangement, NWA ran an ad in a Manila paper calling for graduate engineers willing to work in the U. S. The first day 450 applications were received. By the end of the week the number had risen to 840. Almost every branch of engineering was represented.

Airline personnel compared the curricula at the various colleges



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FIG. LQ600-200
200 lb. S.P.—400 lb. W.O.G.
550° F.

FIG. LQ600-150
150 lb. S.P.—300 lb. W.O.G.
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Thousands of these valves have served for as long as five years without replacement, regrinding, maintenance, or leakage—even on the most severe services. Their patented Brinalloy* seats and discs are more resistant to wear and corrosion than 500 Brinell Stainless Steel... even outlast case-hardened Stainless Steel exceeding 1000 Brinell. LQ600 Valves practically eliminate maintenance costs!

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It's good looking . . . presents a cleaner, more attractive appearance.

It resists corrosion. Weather, moisture, general industrial fumes and other unfavorable conditions can't destroy it or mar its good looks.

It's nonmagnetic, nonsparking . . . has Underwriters' Laboratories approval. Because it is nonmagnetic, there's less voltage drop. Longer runs are practicable . . . or smaller wires. And Alcoa Aluminum Rigid Conduit is ideal for separating conductors, regardless of load.

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and universities of the Philippines with the engineering program of Massachusetts Institute of Technology and found that graduates from the University of the Philippines, for instance, were able to take graduate work at M.I.T. without making up subjects. They also found that over a three-year period, the Philippines graduated 6281 engineers, creating an over supply in the country.

To bolster its project, NWA secured from the president of the Philippines an administrative order creating a committee to take charge of Filipino participation in the program. Among its other functions, the committee was authorized to endorse, for placement, qualified applicants for the consideration of the appropriate United States Agency administering the program; to negotiate, for the benefit of other Filipino participants, opportunities for agriculturists, industrialists, veterinarians, engineers, architects, teachers, economists, and other professionals.

American manufacturers approached by NWA have shown a considerable amount of interest in the idea. Although consulting engineering firms have not been asked to participate in the program, the same type of exchange program might offer a stop-gap solution to their problems in recruiting engineers.

Other countries graduating more engineers than they need might also be interested in such an exchange program.

Highway Construction Boom

More money is being spent by the ten provinces of Canada on highway construction than for any other item in their budgets, the Canadian Good Roads Association reports. This year it is estimated more than \$700 million will be spent on roads in Canada, of which provincial governments alone will spend \$487 million. Federal and municipal road building expenditures account for the remainder.

About 50 percent of federal government expenditures for roads will be contributions to the provinces for further construction of the Trans-Canada Highway, and for Trans-Canada Highway sec-

CONSULTING ENGINEER

Bayley

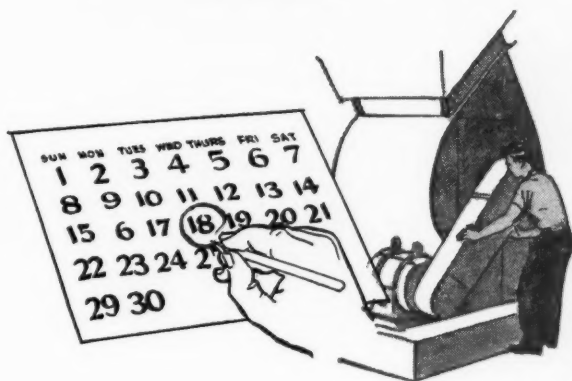
FAN-A-GRAFICS

For Equipment Engineers

Put MAINTENANCE On a Calendar Basis!

Good fans require a minimum of maintenance service. But an ounce of prevention is worth a pound of cure, so periodic inspections are recommended. The desirable frequency of inspection will be determined by severity of service, pressure, speed, materials handled, ambient conditions, and similar considerations.

Here are some points particularly important to check regularly:



OUTSIDE The Fan: CHECK FOR ...

BEARINGS:

- * Keep Lubricating Instructions available and follow them
- * Overheating is a danger signal
- * Tightness of bolts, collars, seals, etc.
- * Alignment should be maintained

FOUNDATION AND ISOLATION MEDIUM:

- * Tightness — check fastening
- * Soundness — watch for failure of cement, cork, rubber, etc.

HOUSING:

- * Firm and tight seams and fastenings
- * Corrosion — keep paint fresh, treat cause of deterioration

SHAFT:

- * Running true — should not whip or wobble
- * Galling in bearings means unsafe condition

INSIDE The Fan: CHECK FOR ...

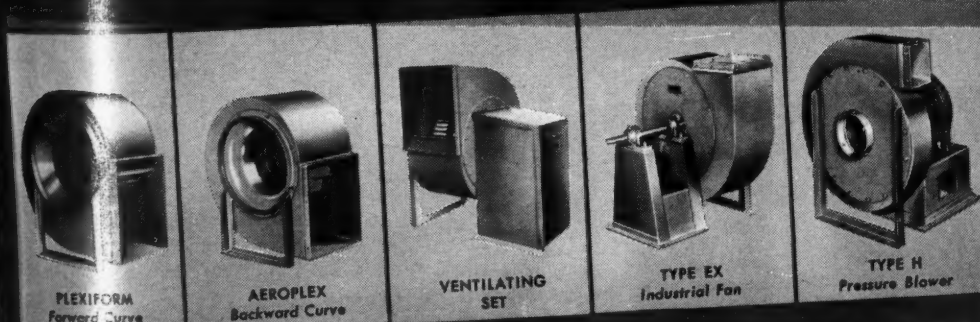
WHEELS:

- * Blades tight, especially bolted or riveted type
- * Excessive dirt accumulation may unbalance wheel, overload shaft
- * Excessive abrasion may cause failure
- * Running true — no striking or wobbling
- * Set screws tight — vibration may have loosened them

HOUSING:

- * Abrasion — near outlet, particularly — may result in perforation
- * Sediment and moisture accumulation may produce corrosion
- * Corrosion from contaminants may require air or fan treatment

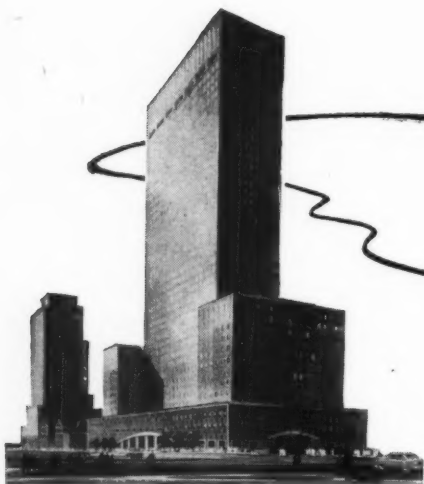
Faithful attention to these precautions will pay dividends in more efficient, trouble-free Fan service.



Engineered AIR HANDLING EQUIPMENT

6610 W. BURNHAM
MILWAUKEE, WISCONSIN

BAYLEY BLOWER COMPANY



New Socony Mobil building, New York City. Galbreath Corp., owner; Jaros, Baum & Bolles, Consulting Engineer; Kerby Saunders, Inc., Air Conditioning Contractor; Turner Construction Co., Builder.

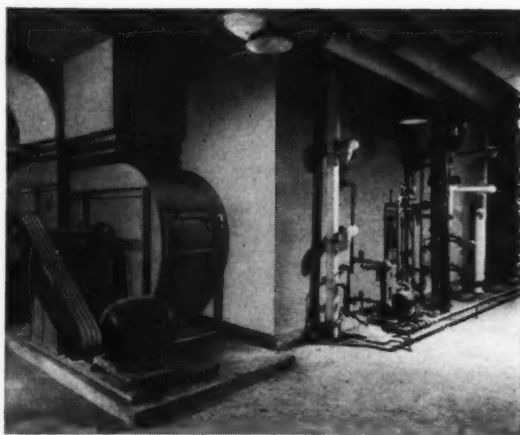
WORLD'S LARGEST AIR CONDITIONED COMMERCIAL OFFICE BUILDING USES 75 FANS, 22 CONDITIONING UNITS BY "BUFFALO"

A new landmark at Lexington and 42nd St., New York, the Socony Mobil building is a model for office buildings of the future. It is the largest fully air conditioned commercial office building in the world — the largest built in New York in a quarter-century. Offering so much to tenants, it is little wonder that its 1,300,000 square feet were virtually 100% rented before completion.

Selection of "Buffalo" for all the fans and many of the conditioning units reflects the confidence which engineers, owners and contractors have placed in "Buffalo" for the past 79 years. You will find "Buffalo" air handling equipment in outstanding plants, hotels, institutions, stores and public buildings throughout this hemisphere. And everywhere, you will find it performing to satisfaction, because "Buffalo" builds the "Q" Factor* of Quality into every unit. If you have a job for air, write "Buffalo" into the plans to insure the results you want.

"Buffalo" Type BL Fans handle air in Socony Mobil building. These fans (some of them 13 feet high) plus "Buffalo" Axial Flow Fans and "Buffalo" Short-boy Ventilation Units move all the air. PCLW Dehumidifiers, Humidifiers and PC Air Conditioning Cabinets process the air for various zones.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*



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BUFFALO, N. Y.

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AIR CLEANING
FORCED DRAFT

AIR TEMPERING
COOLING HEATING

INDUCED DRAFT
PRESSURE BLOWING

EXHAUSTING

tions through the national parks.

The Province of Ontario has budgeted \$181 million for highways this year, as compared to last year's figure of \$154 million. British Columbia will spend \$79 million, double last year's outlay.

The provincial governments have nearly quadrupled their road construction spending since 1946.

Dnieper River Canal

The Soviet Department of Hydro-economy has proposed the building of a canal to link the Dnieper River with the industrial center of Krivoy Rog. The project would supply water for industrial purposes in this iron ore basin and would make possible irrigation of over 49,000 acres of land. It would also provide water transportation between Dnepropetrovsk and Dneprodzerzhinsk and eventually link up with the North Crimean Canal along the Azov Sea into the Donbas Industrial area.

The 44-mile long canal would run from the artificial lake at Kakhovka along the bed of the Kamenka River to the Krivoy Rog metallurgical plant where a water reservoir will be built with mechanized port facilities.

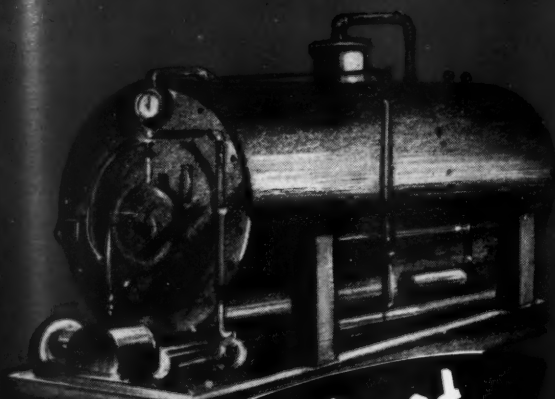
For vessels to enter the canal at Kakhovka Lake they would be raised 260 ft in a water-filled tank. The tank will measure 59 x 394 ft and will be lifted by 300 steel cables operated from a control tower. The vessels will then pass into an aqueduct of ferro-concrete on piers. A pumping station on the bank of the lake would pump water into the aqueduct through a system of pipes. The canal would have three dams.

Saudia Arabia Railroad Planned

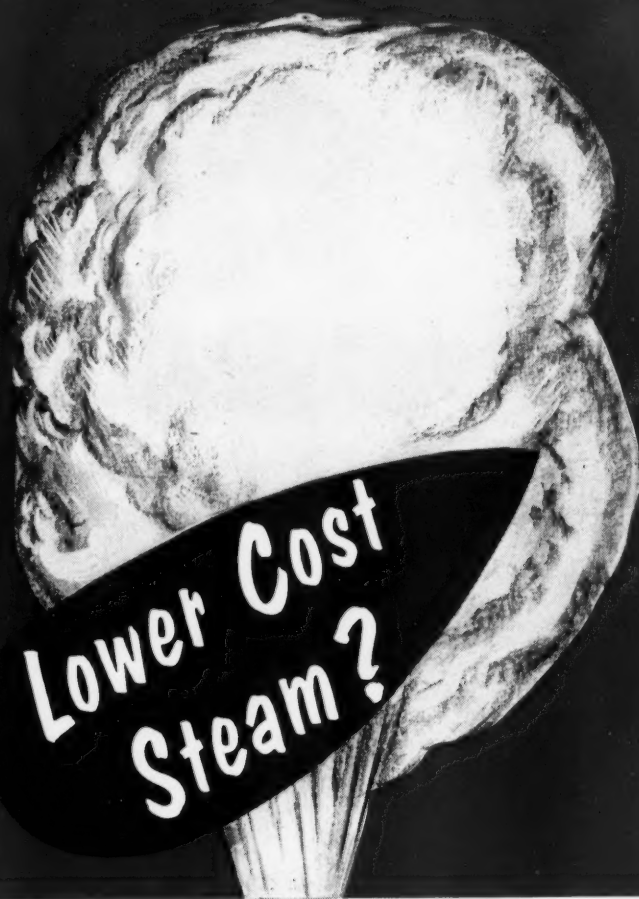
Brown & Blauvelt has begun preparation of engineering plans for extending the Hejaz railroad 500 miles south from Ma'an, Jordan to Medina, Saudia Arabia. The \$25-50 million rail line will improve transportation between Arabia, Jordan, and Syria and will rehabilitate a line destroyed by Lawrence of Arabia during World War I.

Contract for design and construction supervision is actually with IREX (International Resources Engineering and Explora-

Which do you really want?



A Lower Cost
Boiler



Lower Cost
Steam?

A word about price vs. cost

When you come right down to it, a boiler is only as "cheap" as the results it gives you! A low-cost boiler that's unreliable or incomplete is the most expensive one on the market.

That's why we've always built AMESTEAM GENERATORS up to a standard, not down to a price. Throughout our 108 years of building boilers, this policy has paid off in lower-cost steam for Ames customers. It is no coincidence that so many firms specify "AMESTEAM" on the strength of its reputa-

tion for reliability and economy of operation. Ames customers are invariably "repeat" customers! They know that lower-cost STEAM rather than a lower-cost boiler is the best buy.

AMESTEAM

GENERATOR

20 sizes, 10 to 600 h.p. 15 to 200# Oil,
Gas or Oil-Gas Combination.

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Please send me further information on AMESTEAM
GENERATORS and name of the nearest representative.

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COMPANY

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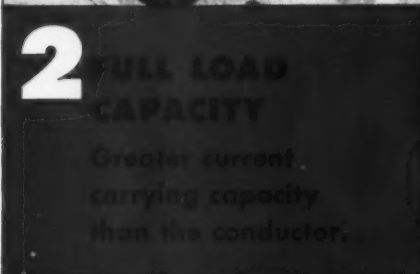
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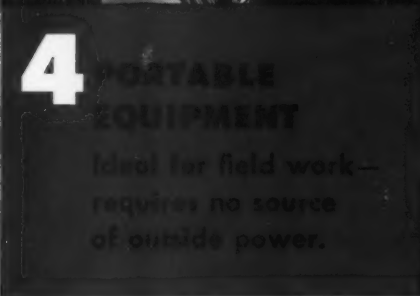
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3 CANNOT LOOSEN OR CORRODE
No bolts to maintain—
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tion Group), a joint venture of Brown & Blauvelt, Civil Engineers; Jack Ammann Photogrammetric Engineers, Inc.; and Geophotoservices, Inc. Contracts are carried out by any or all three firms depending on the nature of the work involved, for this phase by B & B, since it is in the field of civil engineering.

Free-Piston Generators Ordered

An Italian power company has ordered power equipment from France including two 3600-4000 kw groups of turbo-alternators with Sigma free-piston generators and Alsthom gas turbines. The groups will supply auxiliary services for a 140,000 kw steam thermal plant in Sicily scheduled to go on line late in 1957.

Concrete Testing System

French engineers have worked out a system to test concrete for flaws by measuring speed of a shock wave through the concrete. They found that the velocity is linked with the mechanical strength of the material, making it possible by the use of sensitive recording instruments to localize defective adhesion, fissures, and other flaws.

When used on reinforced concrete, the method enables detection of fissures and flaws and checking of adhesion of rods. Combined with the use of a pachymeter, the system allows accurate reconstruction of the plan of the reinforcement network.

Electrification of Canal

For modernization of the Baltic—White Sea Canal, 15 control towers with automatic controlling equipment have been completed and others are under construction. Electrification of traffic signals has made it necessary to build a new power station and next year another will be constructed near the 9th lock. Other improvements include replacement of wooden installations with metal equipment and construction of spillway dams.

Australian Blast Furnace

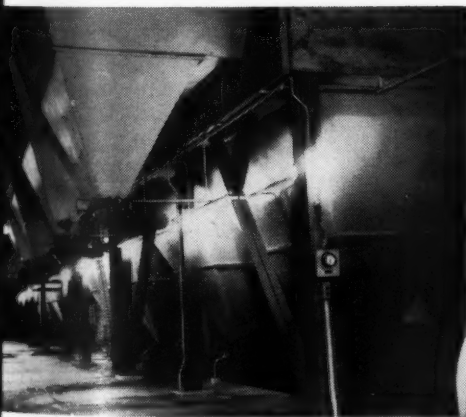
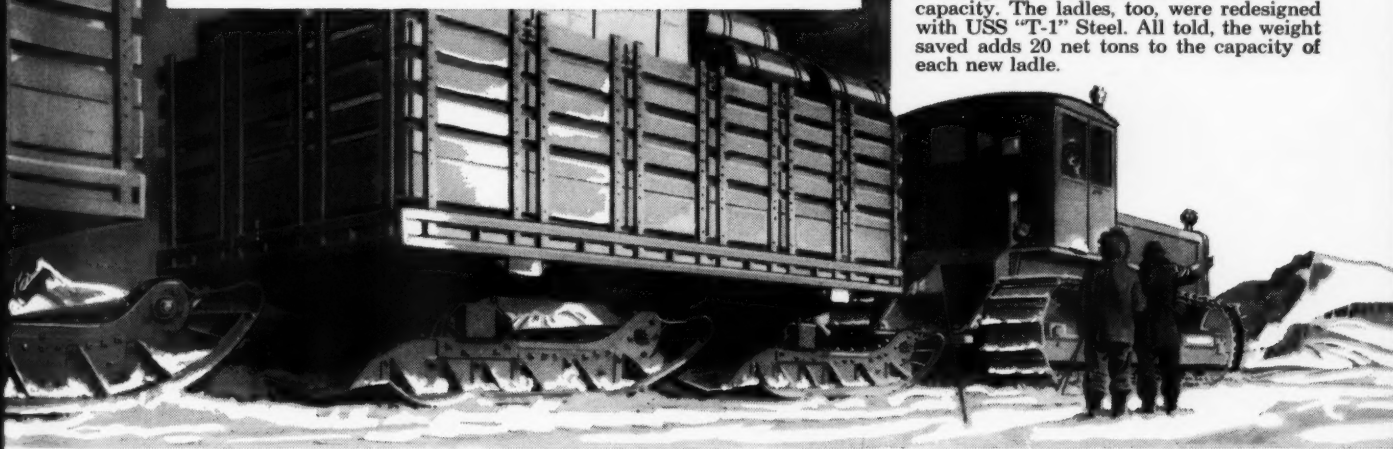
An English firm has contracted to design and build a new blast furnace for Broken Hill Proprietary Co., Ltd. at Port Kembla.

CONSULTING ENGINEER

HOW USS "T-1" STEEL IMPROVES THESE PRODUCTS:

Screaming Cold. USS "T-1" Steel's amazing toughness and resistance to impact is serving "Operation Deepfreeze," the U. S. Navy's current expedition to Antarctica. Skis for rugged cargo sleds are made from 1/4-inch plate of USS "T-1" Steel. In addition to exceptional strength (needed to keep down weight) and sub-zero toughness, good forming and welding characteristics were needed. Only USS "T-1" Steel met the requirements. The sleds were designed jointly by the U. S. Navy and Otaco, Limited, Orillia, Ontario, Canada.

Sizzling Hot. By redesigning with USS "T-1" Steel, crane hooks for 250-ton ladles at U. S. Steel's Edgar Thomson Works were reduced in thickness from 8 1/2 inches to 6 inches. The resulting weight saving of 3 tons permits an increase in actual crane capacity. The ladles, too, were redesigned with USS "T-1" Steel. All told, the weight saved adds 20 net tons to the capacity of each new ladle.



28 Million Pounds of wet, abrasive coal are handled each day at this steam-electric generating station. And USS "T-1" Steel is being used at points of severe wear in coal chutes and hoppers, pulverizer feed pipes and exhaust pipes, and for liners of ash collectors. USS "T-1" Steel's durability under impact and impact abrasion, its great tensile strength and its good weldability are often essential in rugged coal handling equipment. USS "T-1" Steel can add service life and cut repair and maintenance costs in many types of heavy-duty equipment.

Repair Reduces Downtime. In this coal stripping operation, time costs more than any other item; and *lost* time, caused by breakage and wear of power shovel parts, was costing far too much. So the owner, Putnam & Greene, Inc., Philipsburg, Pennsylvania, started using USS "T-1" Steel for repair work. As a result, size and weight of parts have been reduced, while durability has been improved substantially. What's more, USS "T-1" Steel's good weldability speeds repair work.

How It Can Help You

USS "T-1" Steel, with its high minimum yield strength of 90,000 psi and its minimum tensile strength of 105,000 psi, can help you design or build lighter-weight equipment that will last longer. Its unusual toughness can help you design or build equipment capable of taking heavy impact and abuse at sub-zero temperatures. Its excellent weldability can help you cut the cost of fabricating highly stressed parts, and to reduce repair and maintenance expense. Its good creep rupture strength can help you put more durability in equipment that operates at temperatures as high as 900 degrees F.

Somewhere in your operation, versatile USS "T-1" Steel can help you. Write, wire, or phone United States Steel, Room 5442, Pittsburgh 30, Pa.

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POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks

Australia. To cost \$20 million, the furnace will have a capacity of 12,000 tons of pig iron a week, equal in capacity to the world's largest furnaces. The plant is scheduled for completion in 1959.

Faster Than Sound

A block turbine has been put into operation at Besancon, France, that can rotate 1500 times a second, or 90,000 rpm. The device makes it possible to observe the behavior of machine parts at speeds faster than sound, to try out greases and oils, and to study the critical points of wear on parts moving at these speeds. Speed can be adjusted and stabilized at any point between 1000 and 90,000 rpm. It also has an electronic stroboscope for viewing parts in motion.

Guatemalan Wood Treating Plant

Koppers Company, Inc. and G. Kenneth Klose, a Central American businessman, have joined forces to organize a new company to build and operate the first wood treating plant in Guatemala.

Named the Impregnadores de Madera de Guatemala, S. A., the new company will operate the plant on a 40-acre site near the town of Gualan in the Montagua River Valley. The plant will be located halfway between Guatemala's capital city and the Puerto Barrios seaport on the Caribbean Sea. Pine and hardwood timber will be pressure treated at the plant for commercial, industrial, and railroad uses.

One of the principal customers for pressure-treated crossties and other railroad timber will be the International Railway of Central America. Other markets for the treated wood products will be the fruit growing companies of Guatemala and owners of the banana plantations. There also is a market for treated wood to be used in the construction of housing, schools, and hospitals. It is expected that an export market to other Central American and Caribbean countries will be developed in time.

Because tropic weather encourages rapid decay, only pressure-treated wood is considered a permanent building material in Cen-



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tral and South America. Treated wood now must be imported from other countries.

Equipment to build the plant will be transported by ship to Puerto Barrios and then taken by rail to the plant site. Creosote and WOLMAN salts, preservatives to be used at the plant, will be taken by ship to Puerto Barrios. Creosote will be stored in a 400,000 gal tank at the seaport and shipped by rail to the plant as needed. The plant will be equipped with one treating cylinder having capacity to treat ten million board feet each year.

Japan's Underwater Tunnel

Construction on the Kanmon Highway Tunnel, in Japan, is 90 percent complete. The 2.16-mile long tunnel passes under the Kanmon Straights, linking the islands of Kyushu and Honshu. Worked on sporadically since 1939, it is now scheduled for completion in 1958. Longer than any of the under-river highway tunnels in the New York City area, only the Mersey Tunnel in England is longer.

Water-Well Drilling

A new method of water-well drilling is being used in England for large diameter holes. Known as the reverse circulation system, it uses a drill bit carried on a hollow shaft that is rotated slowly as work proceeds. Water flows in the annular space outside the shaft and is extracted up the interior of the shaft. Holes up to six feet in diameter are said to be practical and the method is particularly suitable in soft formations. Applications include dewatering of construction sites and drilling holes for large cast-in-place piles. ▲▲

Expert Witness Reprint

Robin Beach's five articles on "The Engineer as an Expert Witness" are available in a 16-page reprint for \$1.00. Please write to: Reader Service Dept., CONSULTING ENGINEER, 227 Wayne St., St. Joseph, Mich.

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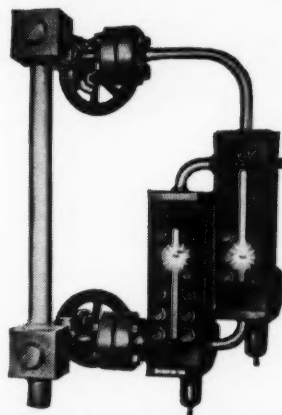
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Curricula for Budding Consultants

STAFF REPORT

CP exclusive EVEN BEFORE THE START of the scramble for engineering graduates that has been going on now for about 15 years, the technical colleges and universities of this country were producing young, prospective engineers fitted primarily for employment by industry. This concentration on education of engineers for industry was intensified by the industrial expansion during and after the war and the resulting competition for graduates among the large industrial firms.

It is easy to see why the colleges and universities have been so anxious to please manufacturers. Not only do the large industries spend money on recruitment programs designed to attract young graduate engineers, but many of these giant firms have working agreements with the schools that put them in preferred positions. Some companies endow the universities directly, others match gifts given by their employees to their old schools, while yet others establish loan funds for students and give substantial scholarships. One company even started on a

program whereby they paid senior students regular salaries for the last term of their college year if they would promise to go to work for them on graduation.

Problem for Consultants

All of these activities are bound to have an effect on the types of curricula offered by American technical colleges and universities. The consulting engineer looking for employees among young about-to-be graduates finds that he is not able to compete. Few consulting engineers, even the largest, have a recruitment program that could compare with those of the large industries. More important, few of the students have any idea what a consulting engineer is or what type of work they would do. When they hear that they would be expected to do design work on a drafting table for a period of months or years, they lose any gleam of interest they might have had.

Not only is there lack of interest on the part of the student, but even the consulting engineer is not particularly interested because he knows that the young

graduate in an engineer's office is worth almost nothing for the first year. The young man has been trained to become an engineer in industry, and he has to reorient himself, adopt a whole new approach, and be trained in technical skills, of which he has little knowledge, before he is able to take a productive part in the business of the firm. It hardly seems worth it to either party to go through with the training period.

Thus, we have the problem stated, but no educators or consultants have yet tried to find a solution. True, a number of prominent consultants have analyzed the situation, and individual thinking is beginning to gel, but there is need for more study before a solution can be found.

Look at it from the point of view of the student. Since it is known that a very high percentage of engineers with as much as five years experience have come to recognize the advantages of private practice, both professionally and financially, it is not inconceivable that this thought could come to many of them earlier—while they are still in school. If, during college and even high school, the work of the consulting engineer could be explained to the students, many would recognize the advantages and would plan their careers toward private practice. This is not too great an undertaking, for it is the kind of program on which all consulting engineer associations, both regional and national could work. In fact, the National Society of Professional Engineers has endeavored for a number of years to interest high school students in engineering, and it is possible that as an adjunct to this program, the Private Practice Functional Groups of the Society could supply speakers to high school assemblies or smaller groups that would be able to explain the work of the engineer in private practice.

Consultant Participation

This program easily could be expanded to provide consulting engineers as speakers to colleges and universities where they could give lectures on private practice and could address student chapters of the Founder Societies. This type of work would make an excellent project for all of the state and regional associations of consulting engineers who comprise the new Consulting Engineers Council. If the American Institute of Consulting Engineers were to join in such a program, their body could be of great assistance because of the prominence of so many of their members.

Jackson and Moreland, of Boston, conscious of the need to interest young engineers in joining a consulting engineer, now are planning to have meetings with engineering teachers to explain to them the opportunities for students in this field. The program is not yet underway, but there is hope that it can be developed as part of a pre-recruitment project.

If consulting engineers in general were to participate in that type of educational program, it is likely

that results would be immediate. Within just one school year a number of students could be shown the very obvious advantages of working for engineers in private practice, and if this were followed up with even a small recruitment program, consultants probably would find no shortage of young graduates looking to them for employment.

Special Training Needed

However, that would be an effort to solve only half of the problem—the simpler half. If young engineers wanted to work for consultants, there still remains the lack of enthusiasm on the part of the consultant for employing a graduate who has been trained for another type of job. It still would be necessary to retrain the graduate and pay him a good salary for many months while he learned a lot he never knew—and forgot much of what he had learned. While the young man may look upon this period as a well paid internship, the consultant who hired him can see only months of expense, all too often followed by the employee leaving for another job after he has completed a goodly part of his training. For a profession that renders primarily service and has most of its operating cost in salaries, the prospect is not inviting.

Several well known engineers, including Col. Harry Terry, of New York, have given much thought



to this. Terry has reached the conclusion that the answer lies in giving a special curriculum to those engineering students who indicate a desire to go into private practice following graduation. He realizes, however, that tampering with the accredited curricula of engineering schools is neither easy nor wise for the layman. No business or profession has done more self-searching in the past half century into the proper courses and the balance of these courses than engineers and the organizations interested in engineering education. To turn to the schools and state that they needed to change their subjects and methods of teaching would be as effective as for a post-Elijah personality to command the Sun to stop.

The faculties of the engineering schools are not unmindful of the industrial source of many of their endowments, scholarships, and loan funds. They also are bored with the idea of changing curricula, for they have exhausted themselves in trying to adjust to the fluid thinking of many leaders in engineering education who demand for ten years that engineers be given more of the humanities, and then reverse themselves for another decade by requesting more emphasis on the technical courses. They are also familiar with the problems involved in having even their present courses accredited by the Engineers Council for Professional Development. It is not likely that they would welcome, unreservedly, a request for either additional courses or a change in emphasis in current curricula—if the request were to be initiated by individuals or to come from casual groups.

Suggested Approach

Yet, it is important to consulting engineers to be able to recruit from a student body, some part of which have completed their formal education with the idea in mind of joining a firm in private practice, and who therefore have prepared themselves for that work in the best manner during their four or five years of technical education. Col. Terry—as well as several other engineers—feels that the best approach to this is to go to some foundation or perhaps to some engineering association and see if a grant cannot be had that would finance a study of the way in which the student engineer could be trained for private practice. It is logical for such a study to be conducted by the American Society for Engineering Education, using the funds provided. Not only would the educators, themselves, be making a study that could best be done by them, but recommendations resulting from the study would be coming from

within the educational fraternity rather than being thrust upon them by outsiders. Then, it would be likely that engineering educators would be much more cooperative and perhaps even take the lead.

Those engineers in private practice who have given thought to this subject agree that this curriculum should not be looked upon as a separate branch of engineering. In other words, the student would still take civil, mechanical, electrical, or chemical engineering as at present, but in the same way that schools now offer an option in the last years of school,

Private Practice would become an additional option. Where currently a school might offer the mechanical engineer a choice between Power Plant, Machine Shop, or Aeronautical options in his third and fourth years, he might instead choose a Private Practice option. It is also generally agreed that students who chose the Private Practice option would be expected to take at least a five year course, with the fifth year concentrating on preparation for private practice in the branch of engineering of their choice.

There, agreement ceases. There is very little harmony of thought when it comes to the question of

just what the student should be taught in a Private Practice option to fit him for work in a firm of consulting engineers. One group says that the obvious need is for more courses in drafting and in the graphic aspects of design. Another group holds with the idea that the young engineer has no business on the drafting board and that the ability to fill a ruling pen is next to superfluous. One group feels that there should be long and intensive courses in professional ethics and business law. Others are not so sure that these subjects require that emphasis. That is just the beginning of the disagreement, which points up the need for a thorough study of any curriculum to be offered in a Private Practice option.

There is, then, a two point program to which consulting engineers, individually and in association, should give consideration:

¶ Bringing to the attention of students, in high school and in engineering schools, the advantages of the private practice of engineering.

¶ Finding funds for a study by some interested and responsive group in engineering education so that engineering schools can proceed to set up an appropriate curriculum for accredited options in the various branches of engineering study.

Through that program the private practice of engineering could advance professionally and could make earlier and better use of the men who find out too late that they prefer private practice. ▲▲



CHECK ALL IMPORTANT DIMENSIONS. THE EQUIPMENT MUST FIT SPACE PROVIDED.



Westinghouse

It May Be Smart to . . .

Inspect Equipment Before Shipment

W. P. MONROE
Sargent & Lundy

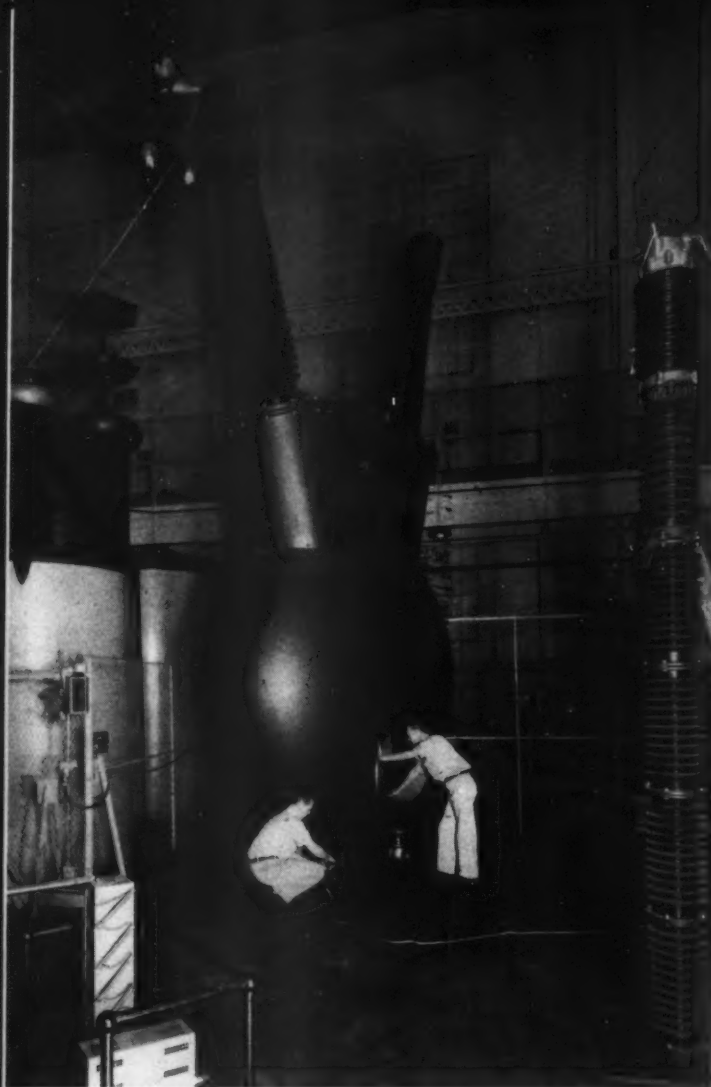
EXCLUSIVE
WHILE QUALITY cannot be inspected into a product, there are some circumstances that make visual inspecting by the consulting engineer advisable before certain items of equipment are scheduled for shipment from the manufacturer's plant.

The importance of receiving the equipment complete as specified, and successfully tested so that it can be placed in service without delay, is reason enough to send the consulting engineer to inspect equipment in the factory. The best time to inspect is when the equipment is nearly complete — yet not so late as to make changes and correction difficult. The dimension and arrangement drawings should have

been approved and the schematic diagrams checked. The equipment should be on the test floor or waiting to be sent to the shipping department.

If this equipment is destined for installation at a project remote from the manufacturer's factory or service station, there is all the more reason for a careful inspection at the factory. All precautions are justified to prevent incorrect operation in the field and delays to replace defective parts. The manufacturer, as well as the customer, is concerned that all goes well.

Some smaller manufacturers may not have long-established procedures for turning out intricate equipment in accordance with technical specifica-



General Electric

tions. In such shops great care probably will be taken to control quality, but these manufacturers will welcome customer inspection so that the product will be free of defects and they can prove their ability to produce to meet the consultant's design.

Minimizing Field Corrections

Some equipment, such as switchgear line-ups and control boards, are nearly always special in important details. It is part of the consulting engineer's job to check the product in order that field correction can be avoided. Field corrections at the project site are both costly and time consuming.

Equipment manufactured in the same city or in the vicinity of the consultant's office can be inspected without great expense of time or money. This condition nearly always justifies an inspection as an inexpensive precaution.

Machines with performance characteristics rigidly specified should be tested in the factory while the consultant is present. He should know for himself that the characteristics of the completed machine conform to his specifications or come within acceptable tolerances. Such tests as impulse tests on large power transformers are witnessed by the consulting engineer, as established policy. Since the engineer

OPERATING TESTS SHOULD BE MADE ON ALL COMPLETED EQUIPMENT TO MAKE SURE IT MEETS CONSULTING ENGINEERS SPECIFICATIONS.

must visit the factory to view those tests, he can take this opportunity to inspect the transformer and auxiliary equipment in detail.

It is the custom of some utilities, especially municipal or state-owned, to require the installation contractor to furnish all the equipment, in accordance with the consulting engineer's specifications. The contractor sometimes uses his own interpretation of the specifications, ordering the equipment by catalog number or by a brief description in his purchase order. The manufacturer may never see the specification written by the engineers. When this procedure is followed, checking of manufacturer's drawings and inspection by the consulting engineer are especially important.

Preparation for Inspection

Specifications for equipment should state the right of the consultant to inspect all equipment before shipment, and they should call for accurate advance notice from the manufacturer when the equipment is nearing completion. This notice should include the exact location of the equipment and the names of the production men the inspecting engineer should contact at the plant. Where shop drawings are required for approval before manufacture starts, prints of these drawings, after approval, should be available to the engineer making the inspection.

Since operating tests must be made on such devices as circuit breakers, contactors, remote-controlled valves, and other items of this type, it is wise to write or telegraph the factory a few days before the inspection, to remind the shop to have control power available for such operating tests. An incidental advantage of writing to the factory directly is to make sure the contract service department of the manufacturer has made the necessary arrangements with the production department for the inspections. On one occasion we received a notice from a manufacturer's main office stating an inspection time; then, after making a 1000-mile trip, we found that the production department was not prepared.

What to Look For

An engineer making an inspection at the factory should be thoroughly familiar with the function of the equipment to be inspected and its relation to other parts of the client's system. Sometimes a mere checking of details will miss an engineering fault in the device. The specifications and drawings may not have included an important provision. An alert engineer, looking over the completed equipment in the

shop, may see something wrong in the arrangement that was not foreseen by the man writing the specifications and merely picturing the equipment in his mind. The latest approved drawings must be available to compare with the equipment being inspected.

The following suggestions will guide the engineer making the inspection.

¶ Check all important dimensions. The equipment must fit in the space provided for it on the drawings.

¶ Check arrangements of components and be on the lookout for omissions or inferior workmanship.

¶ Make operating tests of all components, making use of the manufacturer's test instruments. All hand-operated devices should be operated, including push-buttons on electrical components.

¶ Check contact arrangements of control switches. This check may be difficult with multistage switches but is justified.

¶ The catalog number on the nameplates is not always sufficient indication that the proper device has been installed. A power plant was once put out of service for hours because of a bus flashover caused by wrong inscriptions on nameplates. This led to the operation of a bus sectionalizing switch under load.

¶ Check manufacturer's records of all tests made on the equipment that cannot be witnessed by the inspecting engineer. Obviously, the engineer cannot take the time to ring-out or trace all the control wires, pipes, or tubes on a complicated piece of machinery, but he can satisfy himself as to the manufacturer's inspection procedure. Also, the calibrations of instruments, relays, and valves usually are made in the manufacturer's laboratories, but the records of these calibrations and tests should be available for examination.

Inspection Reports

During the inspection, any defects in the equipment should be called to the attention of the manufacturer, who usually will see to it that the defect is remedied on the spot or as soon as possible. After the inspection, a written report should be made, not only to inform the client but to remind the manufacturer of any defects or omissions that must be taken care of before shipment.

The report also should be brought to the attention of the project engineer who should check to make sure that the latest approved drawings were referred to during the inspection. For this purpose, the inspection report should list the drawings referred to during the inspection, including dates of the latest

NAMEPLATE EVIDENCE IS NOT SUFFICIENT.
CHECK THE EQUIPMENT ITSELF TO SEE THAT
IT IS RIGHT. NAMEPLATE COULD BE WRONG.

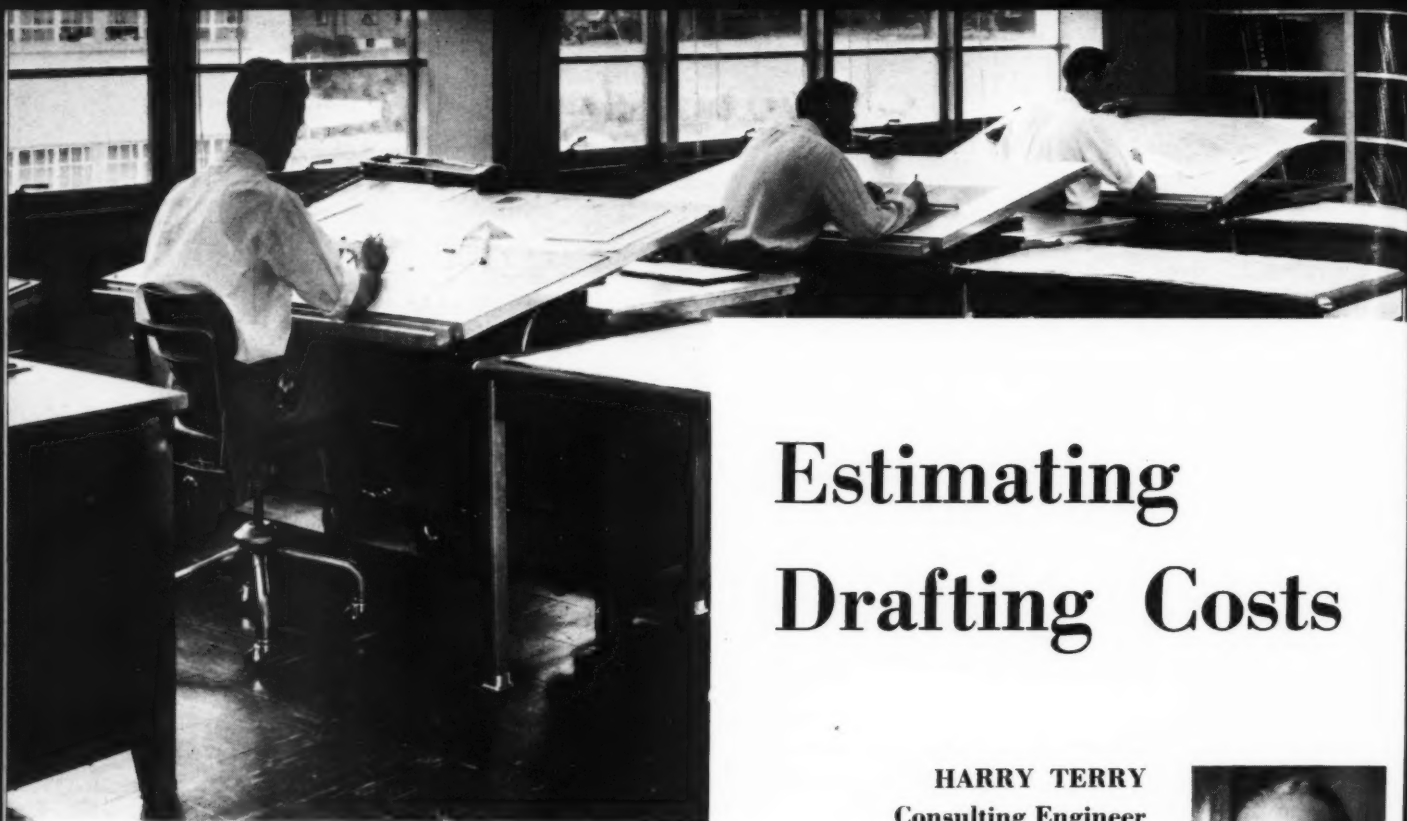
revisions. The report should include the names of the manufacturer's employees consulted during the inspection. This will be useful information in the event of any trouble developing in the field.

The report should refer to checks being made of manufacturer's test records. Certified test reports may be submitted eventually by the manufacturer, but these reports are often late in arriving, and the equipment is sometimes in service before the reassuring information in the formal certified test report arrives.

Handling Releases

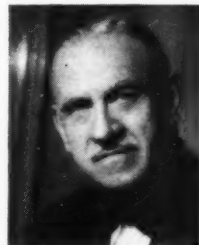
Some manufacturers may request the inspecting engineer to sign a release form for the equipment. It is suggested that the engineer merely write, "Inspected by _____" and sign his name, with the date, since the manufacturer should not be released from any provisions of his contract until the guarantee period in service has expired. There is no reason for the consulting engineer to assume any of the responsibility. He is inspecting for the benefit of his client, not the manufacturer. ▲▲





Estimating Drafting Costs

HARRY TERRY
Consulting Engineer



EVERY CONSULTING ENGINEER who does electrical and mechanical work has to answer the question, "How do you charge for your services?" It is, of course, generally accepted that fees should be $2\frac{1}{2}$ to 3 times the time card cost of engineers', designers', and draftsmen's salaries engaged on the work. It is also usual practice to charge as the engineering fee three-quarters of the fee an architect obtains, based on the cost of the engineering work. Thus, the consulting engineer constantly is confronted with the problem of anticipating the cost of producing his plans and specifications so he can tell a client the approximate cost of services, and so he can determine a completion date for work.

Each engineer, no doubt, has his own method of estimating the time required to produce plans and specifications. One chief draftsman, an acquaintance of mine, has an interesting formula.

"Just take the fee, divide by three, and then divide by the average hourly pay of draftsmen. The result will be the hours of drafting time required to produce the job."

Simple, isn't it?

Another common method is to estimate drafting time for engineering plans by inspection of the architect's plans of the building. Better yet, perhaps, is to estimate the work required on a new job by comparing it with a similar job already finished.

Correlation Analysis

In order to find a formula based on the jobs done by our office during the past five or six years, I have drawn on my management engineering experience

Col. Harry Terry received his degree in mechanical engineering from Syracuse University, a degree in sanitary and industrial engineering from Minnesota University, and a further degree in business administration from N.Y.U. He first opened his office as a consulting engineer in St. Paul and Minneapolis, later moved to Chicago, and at the close of the last war began the practice of engineering in the New York area. His firm does complete mechanical, electrical, and sanitary designs for all types of projects.

During the past few years Col. Terry has been actively engaged in committee work for the New York Association of Consulting Engineers. He is currently Chairman of their Publicity Committee.

with methods of correlation analysis. Here is what I found.

It is reasonable to consider that the time required to produce plans and specifications can be correlated with the following factors on a building project: square feet of floor area, and cubic contents. (See Table 1—Analysis of Drafting Time.)

In Table 1, we see there is some sort of general relationship between square feet of floor area and the time required to prepare the engineering drawings. We note that as the floor area increases, the time increases also, but this is not uniformly true. On some projects the floor area increases without there being an increase in the recorded drafting time; on other projects the drafting time varies even for the same floor area. The same holds true for comparisons of cubic contents and drafting time.

There is no particular difficulty in understanding

why these relationships are not more consistent. These data include a variety of different elements — different draftsmen, different clients, different systems, even different building types.

Analyzing Office Experience

There are two ways in which we might go about deciding exactly how much influence these variables have. One way would be to arrange the data so that the effect of the different factors mentioned would be removed from the results. Thus, if we were to separate the observations into groups according to the different clients and then into groups according to the type of design, the relationship between time and size of building for any single group no longer would be affected by the peculiarities of clients or by engineering or system design. Most of the remaining factors, however, still would be present to affect the results, and even within each subdivision the data still would show many anomalies.

A second way would be to try to determine some sort of average relationship between time and floor area or time and cubic contents. Best of all would be an average relationship between time and both factors. With such an approach we must admit that there are differences from the average in individual projects. Yet, the average can give a better general indication of what to expect even though it may not be completely true for any actual job. So if we know nothing about a job except its size, the average relationship will serve to give us the best guess as to how long it may take to prepare drawings and specifications.

The Regression Equation

Our first problem, therefore, is the derivation of an equation to describe the relationship between drafting time and the influencing factors; square feet of floor area and cubic contents of the building.

It now becomes apparent that there is a definite relationship, and it can be represented by a straight line. Such a line, of course, could be fitted by inspection, but a more accurate result will be obtained by mathematics. We can designate the variable quantities by the symbol X with different subscripts,

using X_1 to represent drafting time, X_2 to represent square feet of floor area, and X_3 to represent cubic contents. Then, the regression equation for the straight line relation between these variables is:

$$X_1 = a + b_2X_2 + b_3X_3$$

Determining Constants

The value of the constants a, b_2 , and b_3 , which determine what the average drafting time will be for a building, could be worked out by a cut-and-try method. It is evident, however, that for any particular criterion of "rightness" only one set of values for these constants can be exactly right. Determining these values so as to give the best equation for estimating X_1 , on the basis of linear relations to X_2 and X_3 , is the first step of linear multiple correlation.

The best values of a, b_2 , and b_3 , in the multiple

TABLE 1—ANALYSIS OF DRAFTING TIME

Job	Floor Area	Cubic Contents	Drafting Time
Economic Foundation	2,277	28,666	48½
Church of St. Mary	3,421	41,049	42¾
Church of St. Mary	4,032	50,358	21½
Nassau Christian Brothers	6,284	131,916	15
Temple Community Center	7,854	59,590	111½
Lady of Fatima Rectory	8,059	87,597	136¾
Trinity Lutheran Church, Hawthorne	8,131	119,718	133¼
Army Training Center, Poughkeepsie	8,776	112,006	103¼
Levittown Church	9,520	179,901	108
Pearl River Elementary School	9,553	124,185	64
Mt. Carmel School	9,713	121,412	151¾
Second Reformed Church, Tarrytown	10,824	146,376	51½
Valley Cottage School	13,446	183,505	133¼
Larchmont Ave. Church	14,352	430,560	87
Army Training Center, Elmira	14,677	211,041	131½
Purchase Elementary School	16,203	235,245	88¼
Orange County College	16,462	200,001	166¼
Central Nyack School	16,518	230,528	111
Trinity Lutheran, Hicksville	16,873	248,066	121
Lincoln Ave. School	16,904	195,487	182¾
K-4 School, Pearl River	17,537	236,928	101½
Ardsley School Addition	17,901	227,159	125
Stamford Baptist Church	18,207	280,646	212¾
Scarsdale Police Station	18,375	238,263	94½
Lady of Fatima School & Convent	19,196	220,012	123
Norwood School	19,308	432,199	74
Washington Ave. School	19,832	321,356	56¼
St. Therese School	20,201	309,449	139½
Williamstown Novitiate	20,587	290,713	164½
St. Joseph's School	24,139	300,298	66¾
Annunciation School	24,139	300,298	71
Hitchcock Memorial Church	24,213	361,671	129
Ridge Street School Addition	25,454	291,389	342
Scovill Warehouse	25,622	539,990	118½
Indian River & Quarter Mile Lane Schools	27,116	366,610	118½
Tappan Hill School	27,750	384,914	289½
Sacred Heart High School	29,382	353,118	189¾
Walt Whitman School	30,654	427,064	209¾
Army Training Center, Schenectady	31,135	461,498	198¼
Broadway School	32,399	384,914	311
Rusciano Factory	34,200	631,200	105½
Sacred Heart Elementary School	35,492	595,948	70
Littlebrook School	40,513	540,894	215¼
Hartsdale Elementary School	46,313	607,538	251¼
Concord Baptist Church	59,740	1,227,728	711¾

regression equation, can be determined by the method of least squares. This calls for the solution of the following normal equations:

I $\sum (X_2^2) b_2 + \sum (X_2 X_3) b_3 = \sum (X_1 X_2)$

II $\sum (X_2 X_3) b_2 + \sum (X_3^2) b_3 = \sum (X_1 X_3)$

III $a = M_1 - b_2 M_2 - b_3 M_3$

Symbols

Here M represents the mean value of each variable, and the subscript indicates the particular vari-

able. Similarly, the symbols $\sum (X_2 X_3), \sum (X_1 X_2), \dots$ represent the sums of the products of the variables, corrected to adjust them to deviation from the mean; that is $\sum (X_2 X_3) = \sum [(X_2 - M_2) (X_3 - M_3)]$. Likewise the symbols $\sum (X_2^2), \sum (X_3^2) \dots$ represent the sums of the squares of the variables, also adjusted to deviations from the mean.

Tables 2 and 3 give the derivation of values a, b_2 and b_3 . In these calculations, the square foot area is divided by 1,000 and the cubic contents is divided by

TABLE 2—NUMERICAL VALUES OF VARIABLE FACTORS

X_1 = Drafting Time
 X_2 = Floor Area of Building \div 1,000
 X_3 = Cubic Contents of Building \div 10,000

X_2	X_3	X_1	X_2^2	$X_2 X_3$	$X_1 X_2$	X_3^2	$X_1 X_3$
2.3	2.9	49	5.29	6.67	112.7	8.41	142.1
3.4	4.1	43	11.56	13.94	146.2	16.81	176.3
4.0	5.0	22	16.00	20.00	88.0	25.00	110.0
6.3	13.2	15	39.69	83.16	94.5	174.24	198.0
7.9	6.0	112	62.41	47.40	884.8	36.00	672.0
8.1	8.8	137	65.61	71.28	1,109.7	77.44	1,205.6
8.1	12.0	133	65.61	97.20	1,077.3	144.00	1,596.0
8.8	11.2	103	77.44	98.56	906.4	125.44	1,153.6
9.5	18.0	108	90.25	171.00	1,026.0	324.00	1,944.0
9.6	12.4	64	92.16	119.04	614.4	153.76	793.6
9.7	12.1	152	94.09	117.37	1,474.4	146.41	1,839.2
10.8	14.6	52	116.64	157.68	561.6	213.16	759.2
13.4	18.4	133	179.56	246.56	1,782.2	338.56	2,447.2
14.4	43.1	87	207.36	620.64	1,252.8	1,857.61	3,749.7
14.7	21.1	132	216.09	310.17	1,940.4	445.21	2,785.2
16.2	23.5	88	262.44	380.70	1,425.6	552.25	2,068.0
16.5	20.0	166	272.25	330.00	2,739.0	400.00	3,320.0
16.5	23.1	111	272.25	381.15	1,831.5	533.61	2,564.1
16.9	24.8	121	285.61	419.12	2,044.9	615.04	3,000.8
16.9	19.5	183	285.61	329.55	3,092.7	380.25	3,568.5
17.5	23.7	102	306.25	414.75	1,785.0	561.69	2,417.4
17.9	22.7	125	320.41	406.33	2,237.5	515.29	2,837.5
18.2	28.1	213	331.24	511.42	3,876.6	789.61	5,985.3
18.4	23.8	95	338.56	437.92	1,748.0	566.44	2,261.0
19.2	22.0	123	368.64	422.40	2,361.6	484.00	2,706.0
19.3	43.2	74	372.49	833.76	1,428.2	1,866.24	3,196.8
19.8	32.1	56	392.04	635.58	1,108.8	1,030.41	1,797.6
20.2	30.9	140	408.04	624.18	2,828.0	954.81	4,326.0
20.6	29.1	165	424.36	599.46	3,399.0	846.81	4,801.5
24.1	30.0	67	580.81	723.00	1,614.7	900.00	2,010.0
24.1	30.0	71	580.81	723.00	1,711.1	900.00	2,130.0
24.2	36.2	129	585.64	876.04	3,121.8	1,310.44	4,669.8
25.5	29.1	342	650.25	742.05	8,721.0	846.81	9,952.2
25.6	54.0	119	655.36	1,382.40	3,046.4	2,916.00	6,426.0
27.1	36.7	119	734.41	994.57	3,224.9	1,346.89	4,367.3
27.8	38.5	290	772.84	1,070.30	8,062.0	1,482.25	11,165.0
29.4	35.3	190	864.36	1,037.82	5,586.0	1,246.09	6,707.0
30.7	42.7	210	942.49	1,310.89	6,447.0	1,823.29	8,967.0
31.1	46.1	198	967.21	1,433.71	6,157.8	2,125.21	9,127.8
32.4	38.5	311	1,049.76	1,247.40	10,076.4	1,482.25	11,973.5
34.2	63.1	106	1,169.64	2,158.02	3,625.2	3,981.61	6,688.6
35.5	59.6	70	1,260.25	2,115.80	2,485.0	3,552.16	4,172.0
40.5	54.1	215	1,640.25	2,191.05	8,707.5	2,926.81	11,631.5
46.3	60.8	251	2,143.69	2,815.04	11,621.3	3,696.64	15,260.8
59.7	122.8	712	3,564.09	7,331.16	42,506.4	15,079.84	87,433.6
Sums	903.3	1,346.9	6,504	24,141.81	37,059.24	171,692.3	59,798.79
Mean	20.07	29.93	144.53				
Correction Item				18,129.23	27,032.28	130,535.3	40,312.72
Corrected Sums				6,012.58	10,026.96	41,157.0	19,486.07

10,000 to reduce the number of digits to be handled.

Having computed the values for a , b_2 , and b_3 , we now can write our regression equation with the best values, as determined by mathematical calculation:

$$X_1 = 12.0 + 4.55X_2 + 1.38X_3$$

where X_1 = drafting time, X_2 = floor area of building \div 1,000, and X_3 = cubic contents \div 10,000.

Standard Error of Estimates

Having worked out the equation for estimating the drafting time to prepare mechanical and electrical drawings, using as factors the building floor area, and the cubic contents, it is desirable to measure how closely such estimates agree with actual values.

The standard error of estimate for a multiple regression equation measures the closeness with which estimated values agree with the original values.

The necessary computations are shown in Table 4. The operations performed in this table can be mathematically stated as follows:

First, an estimated value of the drafting time is determined by substituting in the regression equation the values for X_2 and X_3 given by each observation in Table 4. The symbol X_1' represents this estimated value; X_1 denotes actual drafting time.

Each estimated drafting time then is compared with the actual drafting time, and the root-mean-square of these deviations is the required standard error of estimate. As will be noted from Table 4 the standard error of estimate S is 53.8 hours.

The Meaning of S

Given an approximately normal distribution of observations concerning the curve of the relationship, 68 percent of all cases will lie within a range of $\pm 2S$ (in this example 107.6 hours) and 99.7 percent within $\pm 3S$ (in this example 161.4 hours).

This same regression equation affords a basis for estimating drafting time for projects in addition to those from which the functional relationship was determined. Whether such estimated values for examples not included in the original study can be expected to agree with true values depends on whether these projects are similar to those from which the equation was developed. The deviation S , derived above, indicates the mean variation of examples from which the regression equation was developed. The less the dispersion from the trend line, the smaller the value of S . Thus, the value of S serves as an indicator of the usefulness of the equation.

Using the Regression Equation

We are now in a position to estimate the normal drafting time required to prepare mechanical and electrical drawings for buildings with from 2000 to 60,000 square feet of floor area on the basis of my office's previous experience, with between 40 and 50 jobs completed within the last five or six years.

It must be up to the judgment of the estimator to

TABLE 3 — DETERMINATION OF VALUES OF CONSTANTS

I	$\Sigma (X_2^2) b_2 + \Sigma (X_2 X_3) b_3 = \Sigma X_1 X_2$
II	$\Sigma (X_2 X_3) b_2 + \Sigma (X_3^2) b_3 = \Sigma X_1 X_3$
I	$6,012.58 b_2 + 10,026.96 b_3 = 41,157.0$
I'	$-b_2 - 1.66766 b_3 = -6.8451$
II	$10,026.96 b_2 + 19,486.07 b_3 = +72,439.6$
(-1.66766) I-	$10,026.94 b_2 - 16,721.56 b_3 = -68,635.9$
Σ II	$+2,764.51 b_3 = +3,803.7$
II'	$b_3 = 1.3759 *$
I'	$-b_2 - 1.66766 b_3 = -6.8451$
	$-b_2 - 1.66766 (1.3759) = -6.8451$
	$-b_2 - 2.2945 = -6.8451$
	$b_2 = +4.5506 *$

$$a = M_1 - b_2 M_2 - b_3 M_3$$

$$a = 144.53 - 4.5506 (20.07) - 1.3759 (29.93)$$

$$a = 144.53 - 91.33 - 41.18$$

$$a = 12.02 *$$

* Values for following equation:

$$X_1 = 12.0 + 4.55X_2 + 1.38X_3$$

X_1 = Drafting Time

X_2 = Floor Area of Building \div 1,000

X_3 = Cubic Contents of Building \div 10,000

determine what to allow as a deviation from the calculated curve for a particular project of his own.

Factors to Consider

Here are some of the factors to consider:

¶ Previous experience with the architect preparing the architectural plans.

Does he live up to a realistic schedule in the preparation of architectural drawings?

How much time is lost because of changes in architectural plans?

How much time is required in conference?

¶ Previous experience with the type of building and its requirements.

How much research is required?

What details will be necessary?

¶ Office drafting organization.

Are draftsmen familiar with the mechanical and electrical systems to be used?

Are the draftsmen fast, slow, or medium?

¶ Time schedule.

Can plans be prepared with normal number of draftsmen or will extra time be required because of too many men employed at one time?

¶ Scale that will be used for the drawings.

Will the scale be such that drawing sheets can be kept to normal size? Too large or too small a scale takes extra time.

Having decided upon the extent of adverse or advantageous conditions to be allowed for, a factor of safety should be applied to the time required. Naturally, the time added as a factor of safety will be in the nature of a percentage of the calculated normal

time. Judging from the actual drafting times shown for different jobs in Table 1, the factor of safety or time allowed to cover contingencies might be 30 percent of the time estimated from the multiple regression equation.

Normal Standard of Performance

The value to be derived by a consultant's office by the development of an equation of a multiple regression trend depends largely upon whether the

Standard Error of Estimate indicates that the experience of the office shows a normal standard of performance. If so, the use of such an equation will give a valuable check of estimates of drafting time to be expected for any new work. Furthermore, the preparation of a chart of expected performance is an excellent method of keeping up with the progress of work in an office — if accumulated weekly drafting time is shown on a chart alongside expected drafting performance. ▲▲

TABLE 4 — COMPUTATION OF STANDARD ERROR OF ESTIMATES

Based on $X_1 = 12.0 + 4.55X_2 + 1.38X_3$

Floor Area ÷ 1,000	Cubic Contents ÷ 10,000	Area Factor	Volume Factor	Time Estimated	Time Actual	Difference d	Difference Squared
X_2	X_3	$4.55X_2$	$1.38X_3$	X_1	X_1	$X_1 - X_1$	d^2
2.3	2.9	10.47	4.00	26	49	- 23	529
3.4	4.1	15.47	5.66	33	43	- 10	100
4.0	5.0	18.20	6.90	37	22	15	225
6.3	13.2	28.67	18.22	59	15	44	1,936
7.9	6.0	35.95	8.28	56	112	- 56	3,136
8.1	8.8	36.86	12.14	61	137	- 76	5,776
8.1	12.0	36.86	16.56	65	133	- 68	4,624
8.8	11.2	40.04	15.46	68	103	- 35	1,225
9.5	18.0	43.23	24.84	80	108	- 28	784
9.6	12.4	43.68	17.11	73	64	9	81
9.7	12.1	44.14	16.70	73	152	- 79	6,241
10.8	14.6	49.14	20.15	81	52	29	841
13.4	18.4	60.97	25.39	98	133	- 35	1,225
14.4	43.1	65.52	59.48	137	87	50	2,500
14.7	21.1	66.89	29.12	108	132	- 24	576
16.2	23.5	73.71	32.43	118	88	30	900
16.5	20.0	75.08	27.60	115	166	- 51	2,601
16.5	23.1	75.08	31.88	119	111	8	64
16.9	24.8	76.90	34.22	123	121	2	4
16.9	19.5	76.90	26.91	116	183	- 67	4,489
17.5	23.7	79.63	32.71	124	102	22	484
17.9	22.7	81.45	31.33	125	125	0	0
18.2	28.1	82.81	38.78	134	213	- 79	6,241
18.4	23.8	83.72	32.84	129	95	34	1,156
19.2	22.0	87.36	30.36	130	123	7	49
19.3	43.2	87.82	59.62	159	74	85	7,225
19.8	32.1	90.09	44.30	146	56	90	8,100
20.2	30.9	91.91	42.64	147	140	7	49
20.6	29.1	93.73	40.16	146	165	- 19	361
24.1	30.0	109.66	41.40	163	67	96	9,216
24.1	30.0	109.66	41.40	163	71	92	8,464
24.2	36.2	110.11	49.96	172	129	43	1,849
25.5	29.1	116.03	40.16	168	342	-174	*
25.6	54.0	116.48	74.52	203	119	84	7,056
27.1	36.7	123.31	50.65	186	119	67	4,489
27.8	38.5	126.49	53.13	192	290	- 98	9,604
29.4	35.3	133.77	48.71	194	190	4	16
30.7	42.7	139.69	58.93	211	210	1	1
31.1	46.1	141.51	63.62	217	198	19	361
32.4	38.5	147.42	53.13	213	311	- 98	9,604
34.2	63.1	155.61	87.08	255	106	149	*
35.5	59.6	161.53	82.25	256	70	186	*
40.5	54.1	184.28	74.66	271	215	56	3,136
46.3	60.8	210.67	83.90	307	251	56	3,136
59.7	122.8	271.64	169.46	453	712	-259	*

Total of 41 projects considered —

Average of 41 projects considered —

*Omitted from total as evidently not a representative project.

$d^2 = 118,454$

$d^2 = 2,889.12$

$S = 53.8$

Council Board Meets in Denver

STAFF REPORT

Cp exclusive THE BOARD OF DIRECTORS of the Consulting Engineers Council met in the Skyline Hotel, in Denver, on September 28-29. Board members from each of the twelve states now associated with the Council were present. John K. M. Pryke, of the New York Association, president of the Council, presided at the two-day session.

The most pressing business of the group concerned the establishment of dues and assessments on a temporary basis so that the Council could have the funds to operate until such time as a satisfactory dues formula can be established. While there were wide differences of opinion as to the proper approach to the problem of interim finance, a compromise was found that satisfied all the Associations, and Pecos Calahan, chairman of the Special Committee on Dues, reported that his committee was making progress in the search for a suitable formula. He promised to present his final report at the next meeting of the Board. The temporary compromise will provide adequate funds for all necessary work of the Council through the current fiscal year ending April 30, 1957.

John Pryke reported that investigations were under way to determine the advantages that might be gained through group participation in an Errors and Omission Insurance Policy for members of the Consulting Engineer Associations in the Council. The H. C. Hauth Company was authorized to act as agent for the Council in dealing with Lloyds of London. This matter of E & O insurance is a complicated one, for only a few companies write that type of policy, and experience of insurance companies in the field is so limited that there is some question as to the equity of the rate structure. Also, enthusiasm for this type of insurance among consulting engineers is far from universal. It was felt by some that engineers having such policies might find themselves sued more often and lose their cases all too frequently because of the tendency of juries to award judgments to the plaintiffs when the defendant is covered by insurance.

It was suggested that an alternate approach might be the establishment of a Legal Action Fund to which all Association members contributed and



COUNCIL SPONSORS CONTEST FOR OFFICIAL INSIGNIA.

from which money could be withdrawn to aid any member in his legal defense.

Barney Dornblatt, of the Gulf Institute, was appointed chairman of a committee to make a full study of the insurance policies available and any alternate plans. He is to report to the next meeting of the Board.

Constitution and By-Laws

The Interim Steering Committee, the group set up to prepare the Constitution and By-Laws, reported that they had completed checking the proofs of these documents and that they are now ready to be printed in the form finally adopted at the Tulsa Organization Meeting. These will be printed and distributed to all member Associations within the next few weeks. This is an important accomplishment, for it is essential that the Constitution and By-Laws be promulgated in order that newly formed Associations and those in the process of organization may be able to write their own constitutions in conformity with the Council's. A special committee was formed to write a model constitution for Associations formed in the future. While there are certain to be differences in the constitutions finally adopted, just as there are differences in state registration laws, it is felt that a model constitution could act as an excellent guide.

Currently, some of the constitutions of state and regional Associations contain sections that are hard to reconcile with the constitution of the Council. The Council does not anticipate any action to force the member Associations into line, but it is hoped that over a period of time amendments to Association constitutions will provide general conformity.

These conflicts have to do primarily with grades

of membership. The Council is set up to represent only the policy making heads of consulting engineering firms, not employees. However, several of the Associations permit employees to belong as Associate Members. Reconciliation of this difference is fundamental.

Council Office

The Board authorized the Executive Committee to establish a permanent office for the Council, separate from the offices of any other organization. (The temporary offices of the Council have been in the office of the New York Association, making use of the part-time services of the secretary of that group.) At the current time, one employee will be engaged to handle filing, correspondence, mailing, and distribution of printed material. It was felt that the employment of a permanent executive secretary could be delayed until the end of the fiscal year, at which time the organizational work and the consolidation of the Council will be complete. The official files of the Council will be maintained at the office of the secretary, E. J. Wolff, in Chicago.

The permanent office of the Council is being established in Washington, D. C. This was the location agreed upon by the Council. The office space to be leased will be such that it can be taken over as the office of the executive secretary, when he is employed.

Intersociety Cooperation

The Board of the Council expressed the desire to enter into activities and cooperate fully with other engineering organizations. However, it was felt best to wait until the Council had completed its own organization and had established firm policies before attempting to undertake definite commitments for joint efforts with other groups. The president was authorized to make contacts with the officers of other engineering organizations and accumulate information with regard to the work that might best be done by joint effort.

Planned Activities

While it is difficult for a new organization to make plans for projects while still in its formative stage, the Board indicated an interest in the publication of a Manual of Practice. Such a manual is now being printed by the American Society of Mechanical Engineers, and a study of this manual will be made to see how well it applies to consulting practice in general. The Council does not want to duplicate the work of other groups, but it is felt that a complete manual, applying to the practice of consulting engineers in all branches of engineering is needed.

It was pointed out that the New York Association has just completed publication of a set of General Conditions (See *CONSULTING ENGINEER*, Oct. 1956) and a study of these will be made to see if they can

be adapted to use by all of the member Associations.

A project is currently under way with the Producers' Council relative to the establishment of an index for filing of manufacturers' literature. It is hoped that an index can be prepared that will be compatible with the AIA Index (which was prepared with Producers' Council cooperation) and yet will give the proper weight to the many items of engineering equipment and materials not sufficiently covered in the AIA system. Undoubtedly, this will take time, but the value would be immense.

It was also proposed that a special reference library be set up in the office of the Council. This library would not be a technical library but rather would be a collection of books and documents dealing with legal, ethical, and business aspects of private practice. It is anticipated that the collection would include copies of all registration laws, codes of ethics, fee schedules, standard specifications, and general conditions for contracts. This library would be available to all members, and photostatic copies of documents could be supplied on request.

Council Insignia

Currently, the Council has no seal or insignia. In order to encourage competition for an acceptable design, Pecos Calahan, executive secretary of the Consulting Engineers Association of California, personally offered an award of \$25.00 for the best design submitted. The Council accepted his offer and matched it with an additional \$25.00 from the treasury. Final rules for the contest have not been adopted, but it is generally understood that the contest will be open to anyone and that the closing date will be about the first of the year. Judges will be selected shortly. Details of the contest will be announced in the December issue of *CONSULTING ENGINEER*, giving all contestants approximately a month to submit their sketches for the design. It will not be necessary to submit finished drawings — simply sketches from which an artist can work.

Membership

The Council currently represents consulting engineer associations in only twelve states, and first in importance is the incorporation within the body the new associations now being formed in many of the states. There are now organizational groups in sixteen states, and several already have elected officers and are holding regular meetings. It is expected that applications for membership from these will be received by the Council before the next Board meeting. The acceptance of these applications and the encouragement of activity in the remaining states is considered the most important current business of the Council.

It was tentatively agreed to hold the next meeting of the Board of Directors of the Council in Atlanta, Georgia, in the early part of February. ▲▲

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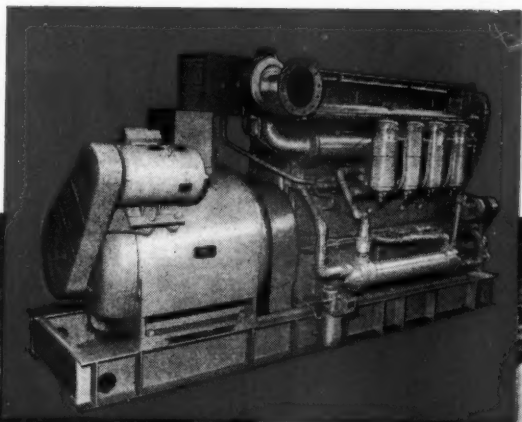
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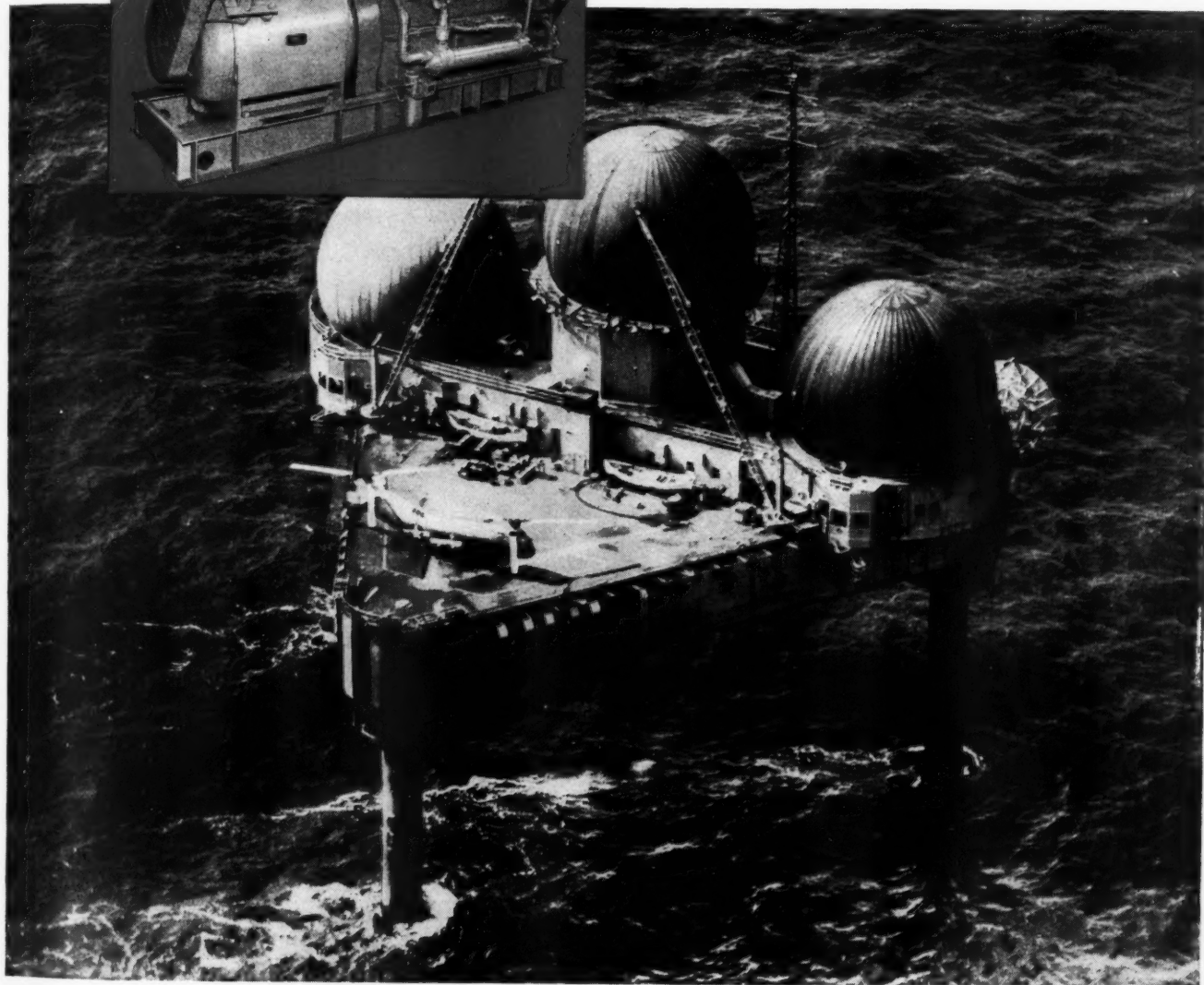
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ENGINEER



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NOVEMBER 1956

How the states plan to use Consultants on the Highway Program

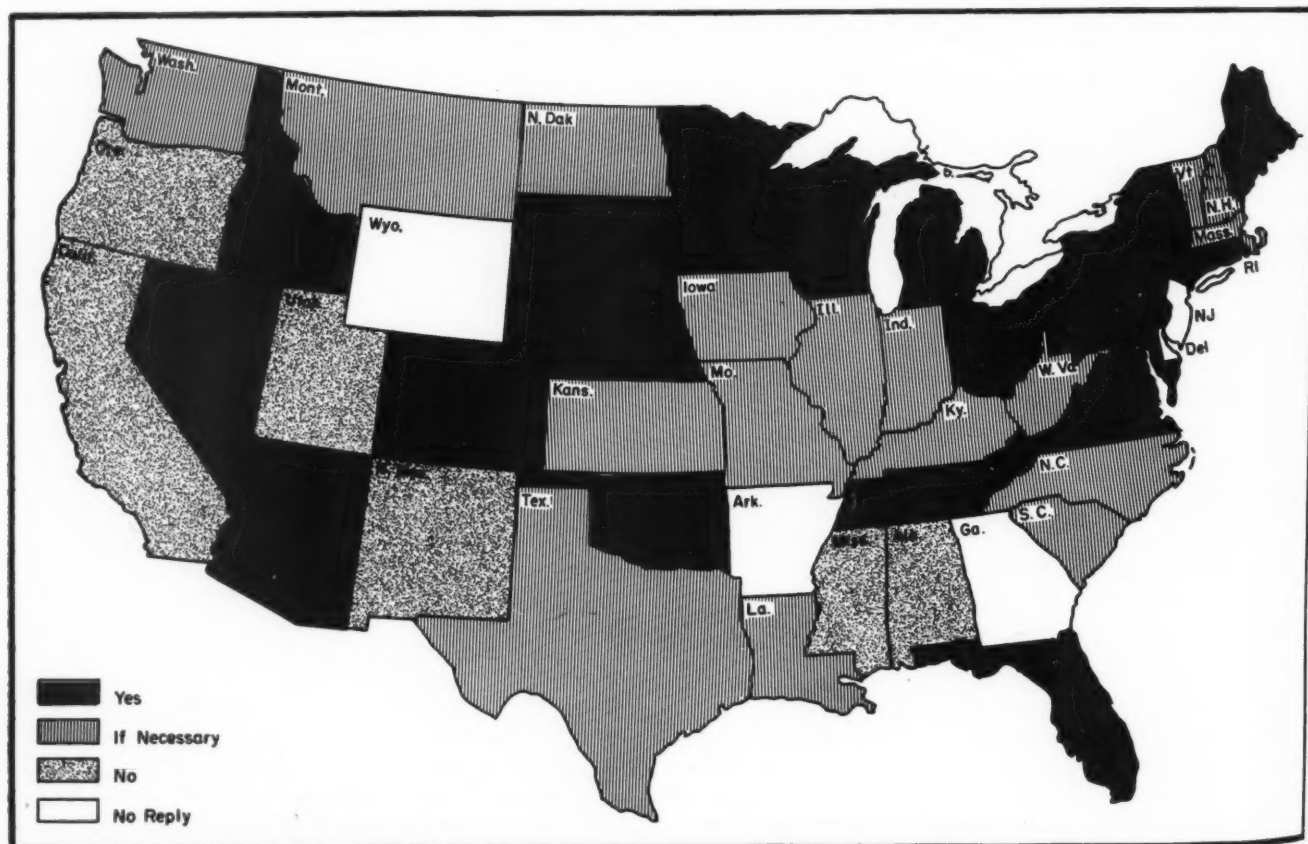
STAFF REPORT

HOW MUCH do State Highway Departments make use of the services of consulting engineers? In an attempt to answer this question, **CONSULTING ENGINEER** surveyed the 48 states, the District of Columbia, and the territories last month. The answers indicate a range of attitude from enthusiasm for the work of consultants, through apathy, to antagonism. Five states failed to answer the questions or acknowledge repeated requests for data. Forty-three states and the District of Columbia answered the questions,

Cp exclusive

and the U.S. Department of the Interior answered for Alaska and the other territories.

On the basis of the answers received, California is the only state that has a clause in its constitution forbidding the use of outside consultants. The California Legislative Council of Professional Engineers, made up of a number of engineering societies and associations, has backed a constitutional amendment going before the people in the November elections, and it will probably be a close vote. This amendment would make it possible for the State to hire



The code shown on this map cannot be accepted without qualification. Few of the State Highway Departments answered the questions of the survey with an unqualified Yes or No. Only three shades are shown on the map, but to be accurate, about 40 different shades would be needed. From the Sunny Shores of California (where there is a constitutional prohibition against the State using independent consulting engi-

neers) all the way to the R. B. Coast of Maine (where consultants are used frequently and the use of their services is to be expanded), there are almost as many attitudes toward the use of consultants as there are state highway commissioners. The three shades on the map indicate general policy and desire rather than absolute fact. The whole picture comes into focus in reading the comments from the Highway Departments.

architects and engineers to do work when the staff of a State agency is unable to perform the work in the course of its regular duties.

Because of this law, the advantages and disadvantages of hiring consulting engineers for highway work has been made into a political issue in California—and actually brought before the people. Here, in the sharp light of public discussion, we see clearly the issues that still show only indistinctly in most other states, where the people generally do not know whether or not the State makes use of consulting engineers—and do not care.

The amendment to permit use of architects and engineers on state work in California was framed by the Senate Interim Committee on Public Works after a two year study of lagging construction on work for which the State had appropriated funds. Then, the constitutional amendment permitting employment of architects and engineers on a consulting basis passed both the Senate and Assembly. Now it must be approved by the voters.

Those in favor of the amendment based their opinion on the following arguments:

- ¶ Bottlenecks at the planning stage could be eliminated by the use of consulting engineers.
- ¶ The State is not able to hire enough good engineers on an employee basis.
- ¶ Engaging consulting engineers is the most economical solution because temporary increases in work do not then require a permanently expanded civil service.
- ¶ Other states and the Federal Government make use of consulting engineers and have found it the most economical system.

Arguments against the use of outside consultants come mostly from the civil service. The California State Employee Association recently sent out a letter headed "Stop the Spoilmen," in which they term this amendment a "great attack" on the merit system in State government. They go on to say, "By this assault, you and I are being attacked philosophically, morally, and economically. The true purpose of the 'Spoilmen' is well hidden, as you will learn from the detailed information we will furnish you soon."

This information has not come through, and it may be that the "true purpose" is so well hidden that even the Employee Association has not unearthed it. Actually, highway departments, just like other government agencies, prefer to be as large as possible, and the managers of departments and subdepartments become powerful in ratio to the size of their staff. Few department managers want to engage outsiders to do work that theoretically could be done by increasing their own staffs and consequently their own power.

This attitude shows up in several of the letters from state highway departments published here. In fact, the phrase, "we employ consultants when

necessary," repeated many times in the letters, indicates a reluctance to use outside consultants except as a sort of last resort.

On the other hand, several states have made extensive use of the services of engineers in private practice, and it would appear that the more outside consultants are used, the better this system is liked. Certainly the use of consultants is growing. Maryland states that they have been using consultants since 1950, as has Illinois. Ohio came into the fold in 1953, and Wisconsin in 1954. Florida passed a resolution permitting employment of consultants in 1955, and Minnesota's law permitting such employment was passed in the same year. There is a trend, and these letters indicate that the trend is likely to grow with the new highway program—despite obvious reluctance on the part of some of the directors of state highway departments.

There is a long way to go before consulting engineers are regularly engaged for state work, but the success of the highway programs in the states using consultants, and cost figures proving that outside engineering work can be more efficient and economical, gradually will bring most states around.

These letters make interesting reading. They indicate current attitudes of state highway departments in unmistakable terms. Sometimes the letters speak more clearly than the writer intended.

The letters sent to the state highway departments were phrased as follows:

"We are currently making a survey to determine the extent to which independent consulting engineers are used in connection with projects of the various State Highway Departments. Would it be possible for you to write us a letter outlining the policy of the Highway Department with regard to the employment of outside consulting firms on the design, specifications, and supervision of construction for such state work as highways, bridges, and similar undertakings?"

Here are the answers:

Alabama

"At the present time, the Alabama Highway Department is not employing any consulting engineers on design and supervision of state highways or bridges."

H. L. Nelson
Highway Director

Arizona

"We have one large bridge under construction, design of which was done by a consulting engineering firm.

"We now have one road project under contract to a consulting engineer for survey, plans, and quantities. We also have six highway and bridge projects being negotiated with consulting engineers, principally for plans and quantities, with surveys



having been made by the Highway Department. We expect to negotiate additional projects very soon."

William E. Willey
State Highway Engineer

California

"At the present time the constitution and civil service laws of the State of California require that such work shall be done by civil service employees. Our use of consultants therefore is limited to occasional special investigations in highly specialized fields where the amount of work involved would not justify the continuous employment of a regular staff."

G. T. McCoy
State Highway Engineer

Colorado

"This Department has in the past engaged consulting engineers for preliminary report, design, and supervision of construction and are presently utilizing consultants on plans and design."

Mark U. Watrous
Chief Engineer

Connecticut

"When work was projected for the construction of the Connecticut Turnpike it was realized that the job was too large for the limited size staff of engineers in the department. State merit system law did not permit a rapid expansion of this staff."

"The department availed itself of the large number of firms of contracting engineers experienced in the work of designing highways and bridges. A number of these firms were engaged for various segments of the turnpike upon which they performed

the necessary survey and design work under the supervision of highway department engineers. All of this work was undertaken in accordance with the standards and specifications used by the department for all of its construction operations. Now that the turnpike is under construction, personnel of contracting firms are serving to expand the engineering supervisory and inspection staff.

"The system proved so effective in the case of the turnpike that we again turned to the services of consulting engineers when we were confronted with the task of surveying and remedying the damage caused by two major floods of 1955. In this problem we were confronted not only with work upon the state highway system but the department was charged by the General Assembly with the task of restoring municipal highways and bridges.

"One engineering firm is assisting the state in the over-all operation of the municipal road and bridge flood recovery work, and eight other firms are each assigned to a group of towns for the detailed work of restoration.

"At present we are making use of the services of some 35 to 40 firms of engineers and consultants in our various operations including the highway and accessory installations for the turnpike, the municipal flood work, and some specialized planning."

Newman E. Argraves
State Highway Commissioner

District of Columbia

"On the basis of the new highway program recently passed by Congress, the Department of Highways of the District of Columbia will solicit the services of private engineering firms to carry out



the preparation of contract plans and specifications for approximately seventy-five percent (75%) of the total highway construction program. Our present policy is to keep our present staff occupied as much as possible. The overload (75%) is assigned to outside firms. Relative to supervision of construction, we do not as a rule obtain the services of private firms to carry out this activity."

J. N. Robertson

Director, Department of Highways, D. C.

Florida

"On September 14, 1955, the State Road Board passed a resolution authorizing the Chairman of the Board, with the advice of the Engineering Division and the Road Board Member from the district involved, to hire private engineers anywhere within the jurisdiction of the Department in the State for surveys, plans, right of way maps, preparation of deeds, and/or supervision.

"Since the above date we have entered into agreements with private engineers for their services on about 25 projects. These services are largely concerned with plans and surveys. Supervisory services are employed only on toll financed facilities."

H. W. Overstreet

Deputy State Highway Engineer

Idaho

"The Idaho Department of Highways has for the last five years requested Counties to do their own engineering work relative to the Federal-aid Secondary County Farm-to-Market System.

"Very few of the Counties in Idaho had County Engineers to do this work, and, therefore, the field of consulting engineers was used. This relieved the

State highway crews from doing other than State highway work, which expedited the entire program of highway construction. The Highway Department has used consulting engineering firms for aerial surveys and in a few instances complete plans developed through aerial surveys. We now have several contracts on urban extensions.

"It would appear from the record that the use of contract engineering is becoming more prevalent in highway construction, and in all cases where we have used this system we have felt that there was considerable advantage to the State in the matter of time and in many instances in the saving of costs.

"I feel that the use of consulting engineers and contracting engineering work will grow in proportion to the expanded highway program in some areas.

"This State has not used consulting engineers for any supervision of construction."

E. V. Miller

State Highway Engineer

Illinois

"Since 1950, the Illinois Division of Highways has been following the policy of engaging the services of qualified consulting engineers to perform design work which could not be done by its own engineering forces with sufficient promptness. Thus far the services performed by consultants have been confined to making of surveys and preparation of plans, specifications, estimates, and right of way plats; they have not included construction engineering.

"The amount of work assigned to consultants has been gradually expanding as the problem of maintaining an adequate engineering staff has become more difficult and our work load has grown. The greatly enlarged program provided for by the



Federal-Aid Highway Act of 1956 will require — at least for the immediate future — further increase in the extent to which we will use the services of consulting engineers.”

R. R. Bartelsmeyer
Chief Highway Engineer

Indiana

“The State Highway Department does not have sufficient engineering forces to handle all of the planning that will be necessary within the next few years on the increased highway construction program. As we see it, the only way to adequately handle the situation is to employ some consulting engineers to do design work. We prefer to call them contract designers as the consulting phase of the work will be handled by the State Highway Department. We do not expect to employ construction supervision by overall contract. It is my understanding that the U.S. Bureau of Public Roads looks with disfavor on that method of supervising construction.”

J. T. Hallett
Engineer of Roads

Iowa

“The Commission is using consulting engineers for design only. All construction is supervised by commission employees.

“We are expanding our forces in design as rapidly as possible, but hire outside engineers where the work load exceeds that of our personnel.

“This is confined largely to bridge designs, but has also included some urban designs on roads. Where road work is done by consultants, it usually includes the surveys also. Where bridge work only is let out, we make surveys and preliminary designs.”

F. C. Schneider
Design Engineer

Kansas

“At the present time we have several firms of consulting engineers preparing road and bridge

plans for the Highway Commission for the construction of improvements in our current highway construction program. It has been the policy of the Commission to use the services of such consulting engineers for projects when it was felt that the over-all volume of work necessitated the use of outside help to supplement the amount of work which could be produced by our own Design Department.

“The work has varied from some of the simpler highway projects to the design of major river structures and at the present includes some work on the Interstate System. It, however, has not been the policy up to the present time to give any great amount of such work to consultants.

“It has also been the policy of the Commission to limit the work given to consulting firms to the preparation of plans. None of the construction supervision has been given to consulting firms.”

Ivan Wassberg
State Highway Commissioner

Kentucky

“It has been the practice of this Department in the past to perform all engineering work with its own forces insofar as it could be done and the work completed as needed. When it was found that engineering work could not be completed with our own forces within the time needed, we have employed consulting engineers on surveys, design, and supervision of construction. The question of employment of consulting engineers depends entirely upon the program of work desired to be completed in a period and the amount of that work which can be done with our own forces.”

D. H. Bray
State Highway Engineer

Louisiana

“It has been the policy of the Department to engage consulting firms on large urban projects and some specialized work such as tunnels. The assignments have varied in scope from route designation studies to complete designs, specification, and supervision of construction.

“Now that the accelerated Federal Road Program is assured, it is hoped that we will be able to build up our forces and the use of consultants can be kept to an absolute minimum. However, in the early years of the program it may remain necessary to employ consultants on some urban projects.”

Grady Carlisle
Assistant to the Director

Maine

“We have, during past years engaged the services of consulting engineers in our work. At the present time, private engineering firms are working on six of our larger projects. It is expected that we will,

during the life of the expanded highway program, continue to use private firms.

"At the present time, the private firms are engaged in preliminary engineering and design work. It is expected that we will be using private firms on some construction work in the future. This has been done in a limited way in the past."

Vaughan M. Daggett
Chief Engineer

Maryland

"Since 1948, we have used the services of consulting engineers to a considerable extent, as was necessary in the production of a \$200,000,000 highway improvement program. In 1952, there was initiated a \$568,000,000 program, to be accomplished over a period of 12 years, and again, to implement the engineering requirements and to produce a backlog of projects for further advertisement, it was necessary that we engage the services of appropriate consultants on a very extensive scale. In this manner we were able to keep ahead of our program, and at the present time we augment our full engineering production by the engagement of consulting engineers whenever necessary.

"Our requirements in the past for consulting engineers were associated with studies; public and

other contacts; surveys; soils investigations, including borings; design of highways and structures; and in some instances, supervision of highway construction and bridge construction."

Walter C. Hopkins
Deputy Chief Engineer

Massachusetts

"When the magnitude of the program by the Department exceeds the capacity of the permanent force, we employ consultants to prepare designs, specifications, and estimates for bridge and highway work. The work submitted by the consultants is reviewed in our Department.

"At the present time our Construction Division has sufficient manpower available to supervise the construction. We have therefore not included construction supervision in the work to be done by consultants."

H. G. Gray
Chief Engineer

Michigan

"The State Highway Department for a number of years has contracted with consulting engineering firms for the design of bridges and grade separation structures when the Department's construction pro-





gram was larger than could be handled by its own bridge design forces.

"Last summer it became necessary, due to a greatly expanded program, to place under contract with consulting engineering firms the design of road work as well as bridges.

"The Department this past year has contracted for surveys, right-of-way plans, and final plans, including engineer's estimates, to consultants for road and bridge projects to augment the output of its own design forces.

"The Department furnishes the consultants with highway location information, soil surveys, geometric design, standards, and specifications. The consultants are expected to make the surveys when not furnished by the Department and prepare plans complete with engineer's estimate and specifications ready for letting of contracts for construction. The Department intends to continue supervision of construction with its own forces."

E. A. Bellenbaum

Assistant to the Chief Engineer

Further information was supplied by the Chief Deputy Commissioner:

"The following is an outline of the policy of the Michigan State Highway Department in connection with the services of consulting engineering firms.

"First of all, the consultant must be qualified through previous work of a similar nature and must have sufficient personnel to handle the work. Our Road and Bridge Divisions review the construction program for the coming year and estimate the amount of work which can be done by our own forces. The remainder of the work is then subject to assignment to approved consulting engineers.

"When a project has been approved for consulting services, consulting firms are invited to submit a proposal for doing the work, including the per-

centage of cost of the project (based on engineer's estimate) that they propose to charge for their services. The proposal is reviewed by the Road Engineer or Bridge Engineer who submits his recommendations along with the proposal to the Chief Deputy Commissioner for approval.

"In the case of road projects, the Department furnishes copies of our standard plans or office standards and a set of plans for a project similar to the proposed job, copies of our work sheet, specifications, soils manual, and necessary tracing cloth.

"The consultant submits his preliminary plans to the Department for review before the field inspection has been made. A representative of the consultant accompanies our field engineer on the inspection. Final plans are reviewed by the Department and, of course, returned to the consultant for any changes or corrections that we feel may be necessary.

"Progress payments for the consultant's services are approximately as follows for road and street projects: 15% on completion of survey, 35% on completion of preliminary plans, 40% on completion of final plans, and the remaining 10% after a period of 12 months.

"In the case of Bridge Design, there are two types of projects. First there is the individual bridge project for which no road plans are required or for which the road plans have already been prepared. The second type of project includes the preparation of both road and bridge plans.

"On our bridge projects, the consulting engineer is provided with the geometric design of the structure, the proposed architectural treatment, and a record of all borings. If the structure is of an unusual design, the consultant is asked to prepare studies and submit them to the Department for review before proceeding with the preliminary plans. The study

consists of a more or less sketch layout of the structure to determine the general features and type that is best suited to be designed for a particular location. The study as approved by the Bridge Division is returned to the consultant with authority to proceed with the preparation of the preliminary plans.

"After these plans are completed to the satisfaction of the Bridge Division, the consultant is instructed to proceed with the preparation of detail plans. In all cases, the preparation of detail plans includes the supplemental specification required to complete the bridge project and an estimate of construction cost.

"In the case of Bridge Design, the consultant is generally paid 25% on completion of the preliminary plans, 65% on completion of final plans, and the remaining 10% is retained for a period of 12 months after completion of the final plans, depending upon the provisions of each individual contract.

"The Department supervises the construction of both road and bridge projects."

G. M. Foster

Chief Deputy Commissioner

Minnesota

"Chapter 237, Minnesota Laws of 1955 reads as follows:

"Section 1. The Commissioner of Highways is authorized to employ and engage the services of registered professional engineers to act as consultants in connection with, and to prepare plans and specifications themselves or by their organization and employees for the construction of trunk highways, and the Commissioner of Highways is

authorized to negotiate for and agree upon the terms and compensation for such employment and services.

"Section 2. This act shall take effect immediately upon its passage and shall continue until July 1, 1957.

"Under this law we have entered into agreements with consulting firms for a variety of services.

"The greatest number have been for the preparation of bridge plans. A lesser number have been for the making of surveys and plans for the full width improvement of streets carrying trunk highways into and through municipalities. A small number have been for the preparation of plans for expressway type of construction in the Minneapolis-St. Paul metropolitan area.

"We expect, of course, that the 1957 Legislature will extend the time beyond the present limit of July 1, 1957. If this is done, we plan to carry on a still more extensive program of using consulting firms for both surveys and plans."

J. C. Robbers

Assistant Chief Engineer

Mississippi

"It is felt by our Department that we have sufficient engineers to handle our construction program and that it will not be necessary at this time to employ consulting engineers."

Roy C. Adams

Commissioner

Northern District

Missouri

"It has been the policy of this Department to obtain the services of consulting engineers for a number of years in the survey and design of high-





ways and bridges. I assure you, however, we follow this practice only because we are unable to obtain sufficient personnel to do our own work."

Rex M. Whitton
Chief Engineer

Montana

"To date this department has had occasion to utilize the services of independent consulting engineers in rare instances only.

"As the expanded Federal Aid highway construction program develops under the provisions of the Federal Highway Act of 1956, it will become necessary that the services of independent consultants be enlisted for the prosecution of a considerable part of Montana's preconstruction and construction activities, including surveys, photogrammetric and otherwise, design, and supervision of both highway and bridge projects."

Scott P. Hart
State Highway Engineer

Nebraska

"Please be advised that the State Highway Department is contemplating, in fact, have hired consulting engineers with reference to the location of the first segment of the interstate route.

"Mr. L. N. Ress, the State Engineer, has advised me that it will be necessary that the services of

consulting engineers be employed very near in whole on the interstate system."

Owen J. Boyles
Secretary
Nebraska State Highway Commission

Nevada

"The Nevada Highway Department has just recently employed the services of two consulting engineering firms to make a study and report of proposed locations for the Interstate Highway System on U.S. Highway 40 through the urban areas of Sparks and Reno, and for the location of U.S. Highway 91 through the cities of North Las Vegas and Las Vegas.

"Up to the present time we have not employed consultants for design preparation, specifications, and the supervision of construction. It is quite possible that the Department will employ such services in the future, especially in the preparation of plans for the Interstate Highway System."

H. D. Mills
State Highway Engineer

New Hampshire

"Over the past three years my Department has taken on the design, supervision, construction, and operation of two sections of toll expressway facilities in addition to our regular highway program. As the new Federal program is now on us we anticipate that basically we shall be able to handle it with our own forces.

"We are particularly weak in our bridge design section and in all probability will look to consultants in the early stages of the new highway program to give us an assist on the design of some of our structures. However, we do hope that all remaining phases of the work we can undertake with our own forces."

John O. Morton
Commissioner

New Mexico

"At present our road program is progressing satisfactorily without the aid of consulting engineers; hence, this Department has established no policy regarding employment of outside consulting firms."

L. D. Wilson
Chief Highway Engineer

New York

"It has been our policy over the past several years to augment the forces of our Department for survey, design, and supervision of construction by the use of outside consulting firms. Over fifty (50) such firms have been so employed.

"At the present time, about half of the work under design in our Department is being done by consulting firms, and the amount currently under

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Including motors for remote control of iris and focus, the camera is only 7" long without the lens, 5 3/8" high, 3 1/2" thick—small enough to fit in almost anywhere. It operates on a 525-line system, 60 fields interlaced, 550-line resolution. No external shock mount is required. All controls can be handled from a remote location. Power requirements are minimum.

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design totals an estimated construction cost of \$600,000,000 for highways for both groups."

Thomas F. Fitzgerald
Chief Engineer

North Carolina

"The North Carolina State Highway and Public Works Commission does not follow a policy of employing independent consulting engineers. We have our own engineering forces which do all of the engineering required in the construction of highways and bridges. There have been a very few instances where we have employed outside engineering services, but in the main, this practice has been limited to only three or four projects.

"It is entirely possible that with the greatly expanded highway program now in effect, it will be necessary for the North Carolina Highway Commission to seek outside engineering firms, but we will not be required to take this step for the placing of our first year money under contract."

A. H. Graham
Chairman

North Dakota

"We wish to advise that we use our own forces whenever possible for design and construction of roads and bridges. We have on occasions used consulting engineers for design of bridges and municipal projects and for photogrammetry, and will doubtless find it necessary to use consulting engineers to a greater degree in the future."

S. W. Thompson
State Highway Commissioner

Ohio

"Authority was granted to the State Highway Director in 1953 to employ consulting engineers for preliminary engineering investigations and reports and for locating, surveying, and preparation of detailed plans and estimates. In 1955 this law was amended (copy enclosed) to include laying out, inspection, and supervision of construction projects. Since October, 1953, the Department has placed approximately 60 projects under consultant agreement for preparation of reports and plans, however, the Department has not yet employed consultants for supervision or inspection of construction.

"Consultants may only be employed by the State for projects costing in excess of \$1,000,000, and located outside of city limits. Plans for projects within city limits are either prepared by the City, County, or by consultants employed by these two political subdivisions.

"Prior to 1953, the Ohio Department of Highways had been able to perform all engineering services with their own forces, but due to a \$500,000,000 bond issue for highway purposes voted by the people, our program has since that time been greatly expanded

and accelerated, and it was necessary to employ the consulting services as previously outlined.

"With the addition of the new Federal program the employment of consulting engineers by the Department will continue until such time as the Department's personnel is able to handle the work."

S. O. Linzell
Director

Oklahoma

"Oklahoma has during the past several years employed consulting engineers to provide for surveys and plans in connection with our highway program. We expect to continue the same policy in the expanded program."

G. H. Bittle
Chief Engineer

Oregon

"Here in Oregon, we have a very competent, well-staffed engineering department as of now, and we do not believe that we will be required to employ outside consulting firms unless there is material change of conditions as now existing.

"It is impossible, of course, to see what may transpire in the future, but the present policy of the Oregon Department is to perform all of its design and supervision of construction with State Highway Department personnel."

R. H. Baldock
State Highway Engineer

Pennsylvania

"The Pennsylvania Department of Highways has for several years utilized the services of consulting engineers to augment its own Department of Design. During the present year, in view of the greatly expanded highway program initiated by the Leader administration, consulting firms have had to be used to an extent greater than ever before.

"The consultants, however, do not prepare specifications, nor do they engage in supervision of contract activities — all of these are performed by Department forces."

Arthur L. Wiesenberger
Chief Engineer

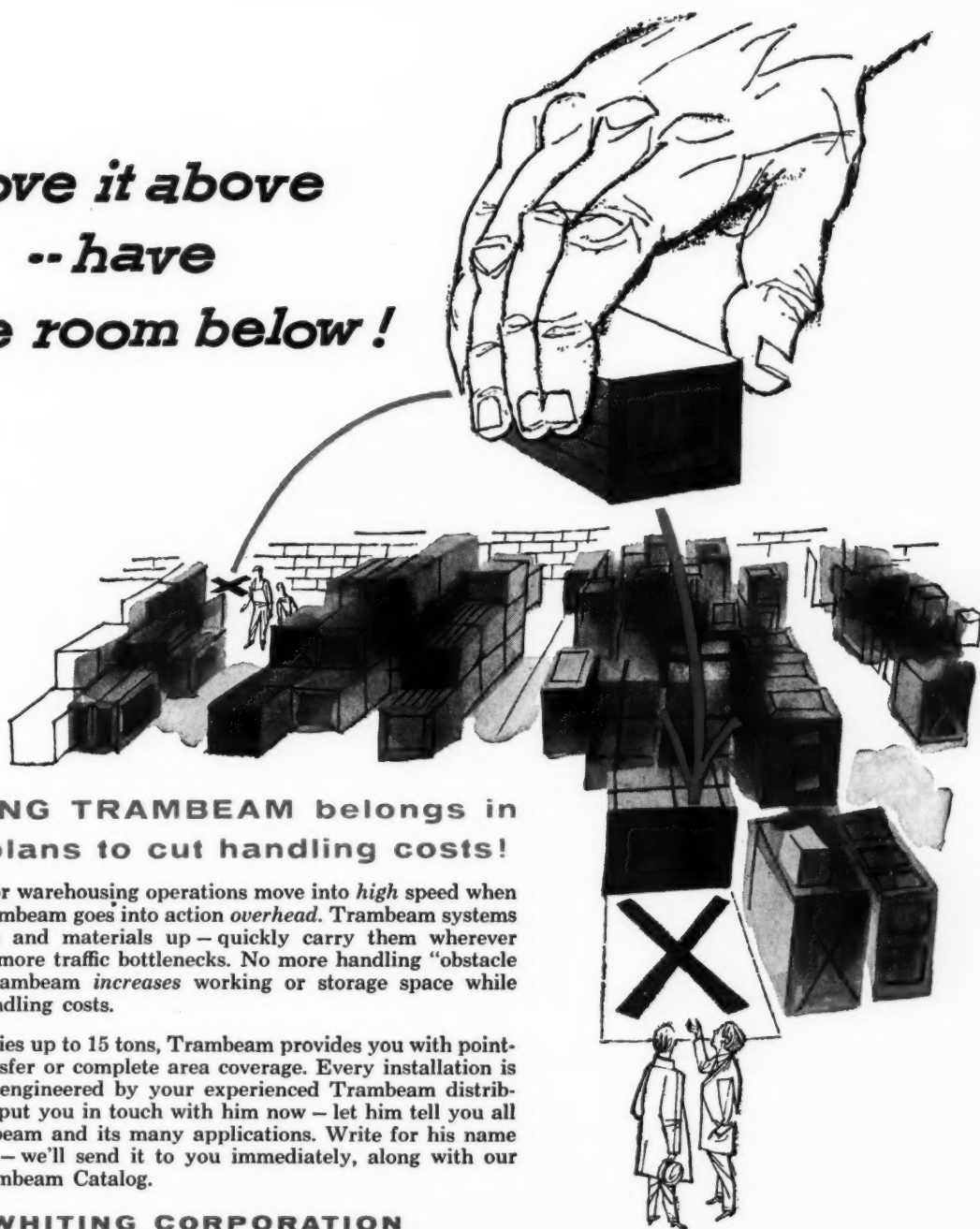
Rhode Island

"It has been our policy to perform with our own forces the preliminary engineering required for all projects and likewise to supervise the construction.

"With our very limited personnel, it is now not possible to carry out and complete the preliminary engineering required on all projects within a reasonable length of time, and we are forced to employ outside engineering organizations to perform a large share of such work.

"So far we have been able to take care of supervision during construction and required engineering

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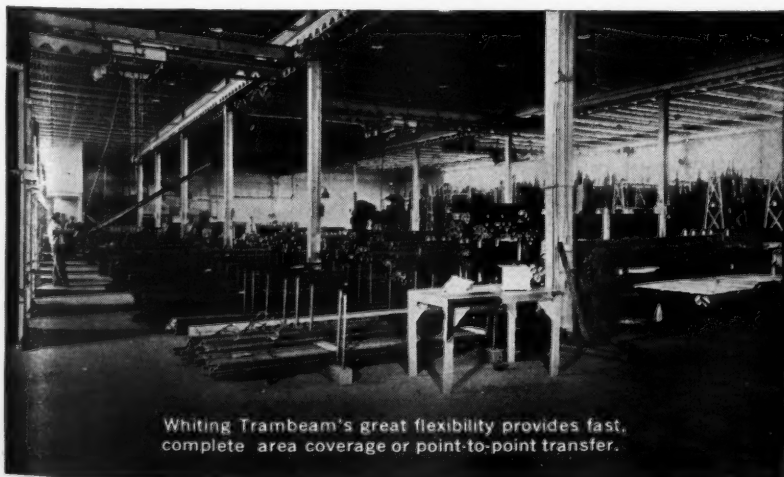
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on the job, but our construction engineering forces, augmented by men normally employed in location and design, are being spread too thin for comfort.

"Unless some means are found which will enable us to enlarge our State engineering forces, we will be forced to employ even more outside engineering if we are to carry out the anticipated enlarged construction program."

Joseph M. Vallone
Director

South Carolina

"It has not been necessary to employ consulting engineers for the surveying or preparing of plans for any of our road projects. However, we have awarded to outside engineering companies three contracts for the design of several bridges.

"It does not appear at this time that we will need to let any large amount of work to consulting engineers in connection with the prosecution of our highway program."

C. R. McMillan
Chief Highway Commissioner

South Dakota

"All of our county secondary roads are built on a consulting basis. We have done some of our general road construction under the same plan. Presently we are employing a group of consulting engineers for the design of the superstructure of the Forest City Bridge in this state."

Chas. J. Dalthorp
Director

Tennessee

"At the present time, we have three firms of consultants working on plans for Interstate projects in the cities of Memphis, Nashville, and Chattanooga. The total length . . . is approximately 54 miles.

"In addition to the plans work, we are having strip maps made by two consulting firms to be used for design purposes in the cities of Memphis and Knoxville. The total length . . . is approximately 55 miles.

"In addition to the above, we have two consulting engineers preparing the design of individual structures on projects other than those noted above.

"We are not employing consulting engineers for the supervision of construction as we are handling this side of the work with our own forces."

R. S. Patton
Engineer of Surveys and Design

Texas

"It has been the practice, although not a strict rule, that all engineering work of the Highway Department be handled by the Department's own staff of engineers. We have had certain projects such as the Baytown Tunnel, a few unusually large bridges, etc., where outside consulting services

were employed, but these projects called for specialized work and represented the exception rather than the rule. When the Urban Expressway projects were first inaugurated, some consultant work was used in planning before the Department had time to develop its own organization . . .

"It is probable that, under the new expanded highway program, consultant work will be utilized for planning but as a general policy, insofar as practicable, the engineering work of the Texas Highway Department will continue to be performed by its own engineering staff."

D. C. Greer
State Highway Engineer

Utah

"This is to advise that up to the present time, the State Road Commission of Utah has not used the services of any independent consulting engineers in connection with the expanded highway program."

R. W. Griffin
Assistant Chief Engineer

Vermont

"The Department's policy regarding employment of consulting engineering firms is to employ them to assist in handling "peak loads" which cannot be handled on schedule without rapid or temporary expansion of staff, and to handle special types of work not ordinarily handled by its particular organization. The greatly expanded highway program has necessitated engagement of consultants in that the Department has not been able to procure sufficient engineering personnel to handle the increased work load.

"At the present time, consultants have been engaged for survey and design work and for special studies. The only specification work which they have done is that involving special provisions pertaining to the particular design on which they have worked.

"It is the opinion of the Department that more satisfactory results can be obtained on construction engineering by use of its own personnel and that employment of consultants for this purpose should only be resorted to in the event of emergency and extreme shortage of engineering personnel."

Cleon A. Perkins
Chairman

Virginia

"The Virginia Department of Highways has employed consultants off and on for surveys, road design, and structural design since World War II.

"Our use of consultants has varied greatly depending upon our program, available funds, and our ability to handle our design with our own forces. In general, we have used consultants on most of our large and time-consuming projects.

"We have been able to keep up rather well with our survey work, and for the most part, the use of

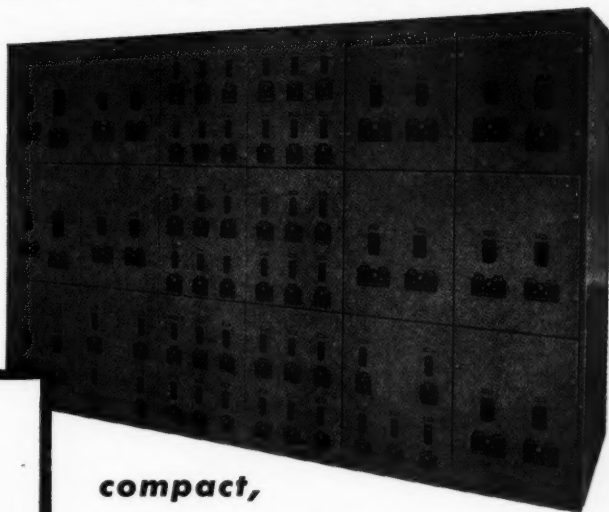
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consultants has been limited to road design and structural design.

"It has generally been the policy of this Department to prepare specifications and special provisions covering the design before inviting a consultant to submit a proposal for the work. Our selection of a consultant has been based on the qualifications of the firm, the length of time required to prepare the plans, the personnel to be assigned to the design, and the fee requested.

"Except on large and unusual projects almost all of our work is covered by our own construction specifications, however, we have requested consultants to prepare special provisions and additions thereto as required."

W. R. Glidden
Assistant Chief Engineer

Washington

"At the present time we do not employ outside consulting engineers. However, with the increased work program, it may be necessary for the department to give consideration to the employment of consulting engineers to meet the time schedules of fulfilling the Federal highway program."

W. A. Bugge
Director of Highways

West Virginia

"The West Virginia State Road Commission has for the past few years utilized the services of consulting engineers in the design and preparation of plans for bridge structures. This procedure was necessary because of the limited number of personnel in our own Bridge Department. Inspection of construction work, however, for bridge structures has always been performed by Commission forces.

"With the passage of the recent highway bill allotting a considerable amount of funds to the states for the Interstate System, we find it will be necessary in West Virginia to also enlist the services of consulting engineers in studies, design, and preparation of plans for at least some sections of this Interstate System. This is also due to the small number of engineers in our organization. No decision has yet been made as to the use of consulting engineering services for construction inspection, and we believe it may be possible to handle this part of the work as well as a part at least of the design and plans with our own forces."

Burl A. Sawyers
Commissioner

Wisconsin

"Wisconsin has had quite a volume of work contracted since 1954.

"The totals for 1955 and 1956 to date amount to \$2,875,000 in contracts with consultants and involve 490 miles. The mileage figure is not particularly revealing for structure survey and design is contracted

without regard to mileage as are a great number of aerial location surveys for route purposes. On the other hand, the mileage figure includes contracts for mileages of strip flights we will use for condition and inventory rather than for new road design.

"Most of our consultant contracts are for survey, design, and plans, either for all three or any combination. Preparation of specifications is generally not contracted as we have our own parent specifications controlling the over-all aspects of the work. Special factors do, of course, enter and become recognized by special provisions in the construction contracts that follow the consulting contracts.

"We have entered into a few contracts to provide engineering supervision of resident engineer category but not generally so. At such times, we retain the administrative supervision for all aspects normally beyond the work of the resident engineer.

"Our contact with consultants is not on the bid and comparison basis generally applied to construction work, but by selection of firms suited to the size and type of work. We approach them to make a definite offer and ask them to state their fee. We consider the offer and accept or reject according to our judgment as to its fitness. Depending upon the way a particular project lends itself, the fee may be based on aerial length, lump sum, or percentage of construction cost. In the few instances where we have engaged construction engineering by contract with consultants, it has been by a rate per day."

Harold L. Plummer
Chairman

The Territories

"The Alaska Road Commission has not in the past made use of consulting engineers. Road Commission activities were transferred in mid-September to the Commerce Department's Bureau of Public Roads and will follow the policy set by that Bureau."

"To our knowledge, the other territories do not employ outside consultants in their road programs."

William A. Arnold
Assistant Director for Insular Affairs
U. S. Department of the Interior

A Challenge

The new highway program will force the use of consulting engineers in many of the states now using only civil service engineers. While the consultant may not like the idea of being engaged only because of emergency conditions, this provides an excellent opportunity to prove the good sense of using his services. Here is an opportunity to prove that the use of consultants increases the value and prestige of the Highway Departments while saving the people money. If the consultant can establish good client relations, his services will be used even when the emergency of the new Federal Highway program has passed — if it ever does. ▲▲



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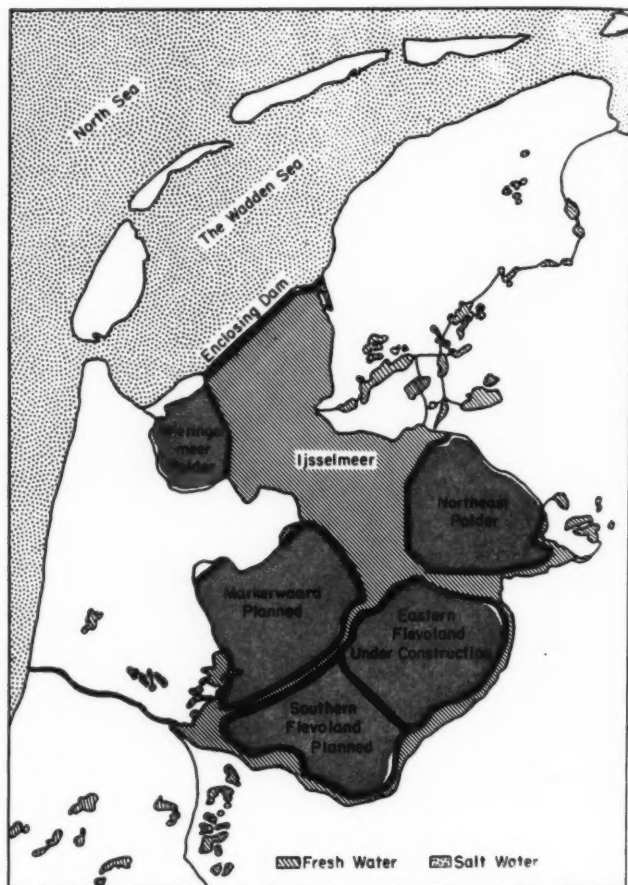
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MAP IN BLACK SHOWS NETHERLANDS IN 1000 A.D. BLUE OVERLAY INDICATES CURRENT LAND AREA.



FIVE DIKE ENCLOSED POLDERS, TWO OF WHICH ARE COMPLETE, WILL ADD 546,000 ACRES OF LAND.

Dutch Engineers Are Making

New Netherlands Out of the Sea

STAFF REPORT

Cp exclusive THE HISTORY OF HOLLAND is more a history of engineering than of politics. It is more a record of man's war against the sea than of man's war against man. About 60 percent of the nation exists only because of thousands of years of engineering work. Had it not been for this constant effort, the most fertile areas of The Netherlands would now be beneath the North Sea.

The first people to come to the lowlands of Holland settled there about 400 BC. The country at that time had about as much land area as it does now—if one is willing to agree that marshes are land. These early Frisians lived in a terrain of peat bogs covered with sand, marsh vegetation, and forests. It was not an inviting land, for at its best it was none too dry and at its worst it was flooded by the sea and the rivers emptying into it—and these floods were not

infrequent. The Frisians lived an extremely free life. No one else wanted this land, so they paid no taxes and recognized no sovereign.

Eventually, these primitive people tired of walking in the mud, so they devoted their extra time to carrying mud out of the lower marshes and piling it on the higher spots to make them ever higher and drier. In this slow way, the Dutch filled their land with high spots on which they established their small villages and farms, until this coastal region in the North became a low marsh dotted with hundreds of inhabited mounds. It is estimated that the amount of clay carried by hand to build these mounds amounted to 100 million cubic yards, about thirty times the amount of material used to build the Great Pyramid of Cheops.

At that time these lowlands were protected to some extent by natural dunes. These dunes had

built up along the coast, from the sands carried out by the low, slow flowing rivers and carried in by the strong tides of the North Sea. While the land behind these dunes was marshy, it was at least out of water except during storms and high tide when the sea swept over the dunes and flooded the lowlands, many times washing the villages from the low, man-made mounds.

Early Protection Works

The natives also learned to build low dikes and coastal protections to save themselves from the sea. The Romans came to Holland at about the turn of the Christian era, and they too did some engineering work in the building of canals and dikes. But nature seemed to object to this taking over of the lands, and as if in retaliation, the dunes gradually moved in on the land. The Romans had built a lighthouse well in from the sea in the mouth of the Rhine, but as the dunes moved in with each high tide and every storm, the lighthouse finally was covered by the shifting sand. After a particularly violent storm, on Christmas, 1520, the lighthouse was found again. It had reappeared on the seaward side of the dunes. Since that time the lighthouse has been located and lost several times and is now under water.

This was a serious business, having the coast move in on you as you built up arable land with spade and basket. It was not nearly so serious, however, as another problem that arose late in the 7th Century when heavy storms began to destroy the dunes and let the salt water of the North Sea flow in over large areas of land at every high tide. Dikes were built that successfully separated the sea from the towns—sometimes for almost a century—then a great storm would strike and thousands of people would drown in one night. The dunes were no longer offering enough protection to keep the sea and the storms from the low dikes. This process culminated in a great storm, in 1295, when the dunes just north of



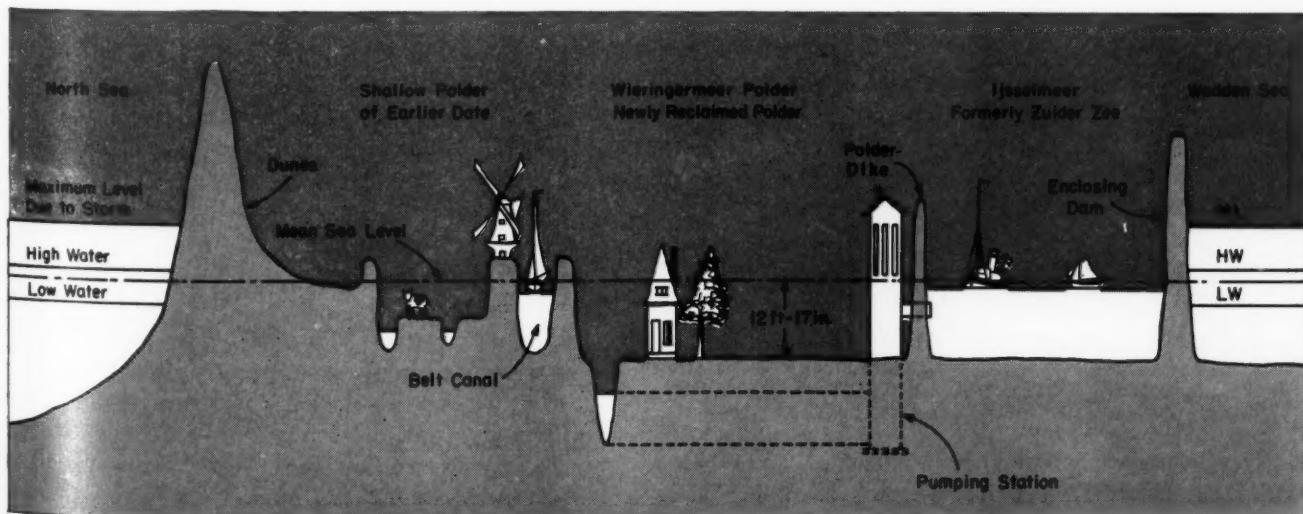
U. S. ENGINEERS INSPECT ELECTRIC POWERED PUMP-
ING STATION BEING BUILT TO DRAIN A NEW POLDER.

Amsterdam were completely destroyed, and the North Sea moved in to join with what had been a large, fresh water lake. This inundation produced the Zuider Zee, a large salt sea covering what had been usable land and a fresh water lake. The map indicates the changes of the coast line between the year 1000 and 1956. Even this does not fully show all of the land lost to the sea, for by 1000, the dunes had already moved back a great distance into the coast line.

Reclaimed Land

The Dutch are quite accurate, then, in referring to the land they have been taking from the sea since 1600 as "reclaimed" land. This is not new land but, for the most part, land that was once arable and is now being retaken and put into use again.

The invention of the windmill as a prime mover for pumps was a moment of historical importance to Holland. Windmills had been used throughout



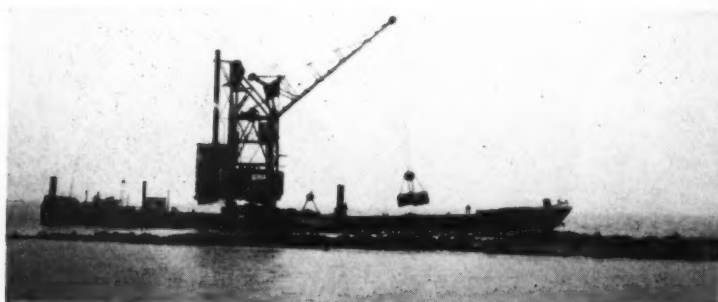
CROSS SECTION OF NORTHWEST HOLLAND'S POLDER LANDSCAPE SHOWING HOW LAND IS BELOW LEVEL OF THE SEA.



THE ISLAND OF URK ONCE WAS A FISHING VILLAGE IN THE ZUIDER ZEE. NOW IT IS A PART OF MAINLAND, NORTHEAST POLDER.



THE FISHERMEN OF URK FOUGHT THE ZUIDER ZEE PROJECT, FEARING IT WOULD CHANGE THEIR WAY OF LIFE.



BARGES BRING SAND AND CLAY, DREDGED FROM THE ZUIDER ZEE TO BUILD DIKES AROUND NEW POLDERS.

Europe for many years for grinding grain, but the first windmill used for pumping was built in Holland, in 1408. Naturally, their adoption to this work was gradual, and it was not until about 1600 that windmills were used in great numbers to pump out the water from lakes and to return those waters to the sea. A great amount of land was reclaimed in the two centuries from 1600 to 1800, and all of this was made possible because of the windmill. After 1800, steam pumps began to make their appearance, but it was almost mid-century before they replaced windmills to any noticeable extent.

Man-Made Lakes

While the mean temper of the sea accounted for most of the land lost in the lowlands of Holland, the people themselves contributed to their own misfortune by digging peat. Most of this lowland carried a layer of peat just below the soil, and when it was found that peat made a good fuel, the Dutch set to work to remove it. This lowered even further the level of the land, and filled Holland with man-made lakes to add to the natural water problem. Most of the major reclamation projects of the 17th and 18th century were in connection with the pumping out of these lakes.

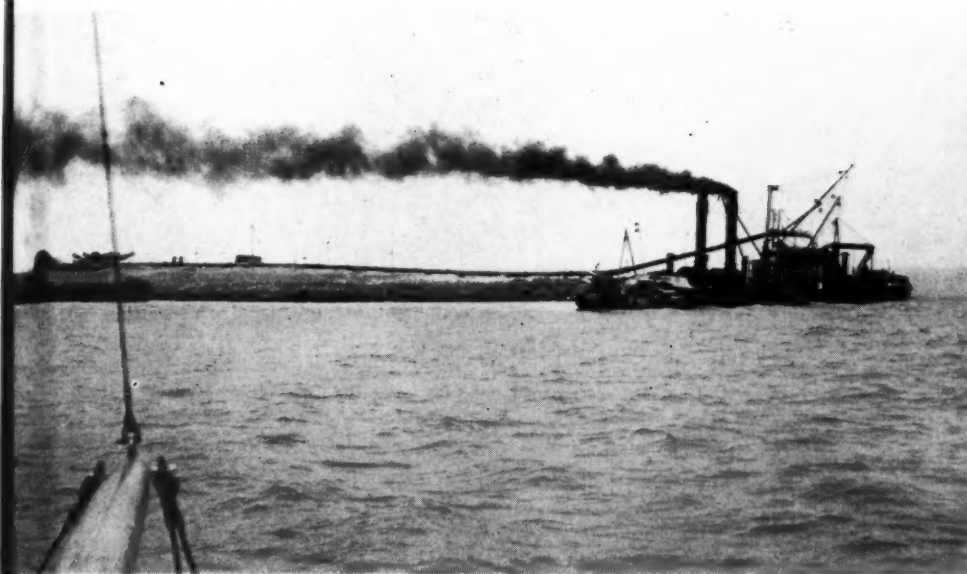
The basic method used was to build a dike around the lake, dig a canal around the outside of the dike, and use windmills to pump water from the lake into the surrounding canal. Then the land inside the

dike, the new polder, was drained completely by digging canals and small drainage ditches. These carried rain and excess ground water to the lowest point in the polder where the pumping windmills were located. The water was lifted up to be carried off by the outer canal.

Lower Land — Higher Water

This system was used over and over in draining lakes and flooded areas. Dikes were also built along the major rivers to contain their waters within a specific channel and to protect the adjacent lands from seasonal floods. The efforts were generally successful, and much excellent soil was added to the farm land of Holland. However, as more polders were built and more dikes were constructed, the rivers grew higher as the pumped out waters flowed into them. This meant that the more dikes that were built, the higher they had to be.

Also, as the polders dried, the peat shrank and the level of the lands fell even lower. Polders were now many feet below sea level and the level of the slowly flowing rivers. This was quite satisfactory so long as the rivers and the sea acted as man wanted them to act, but whenever there were strong tides and heavy winds, the sea ignored man's desires and rose to flood over the dikes. With such low polders and such high dikes, broken dikes were serious matters, and a break in a dike meant drowning to tens of thousands of people. Then there again would



A DIKE GROWS OUT INTO THE SEA AS A STEAM DREDGE DIGS CLAY FROM THE BOTTOM AND PUMPS IT OUT TO THE CONSTRUCTION AREA.

be years of work while the dikes were rebuilt and waters pumped out.

Sand-Filled Harbors

The slowly flowing tidal rivers created another problem. They began to drop sand in their confined beds. The rivers filled and sand bars developed in the harbors. In 1650, while the rivers and harbors were still fairly free of sand, Holland was the greatest of the shipping nations. Over 60 percent of the European shipping fleet sailed from Holland, and the harbors of Amsterdam and Rotterdam were the busiest in the world. The harbors and rivers were navigable by even the largest ships. But sand brought down by the rivers and in by the tides changed all this. By 1800, the waterways were so choked with sand that when King William of Orange tried to inspect the Rhine, his yacht—with only a three foot draft—went aground. Holland suffered a period of great depression while England, France, and the United States took over the commerce of the world. It was not until the invention of the steam dredge, in 1860, that the Dutch found an answer to this problem.

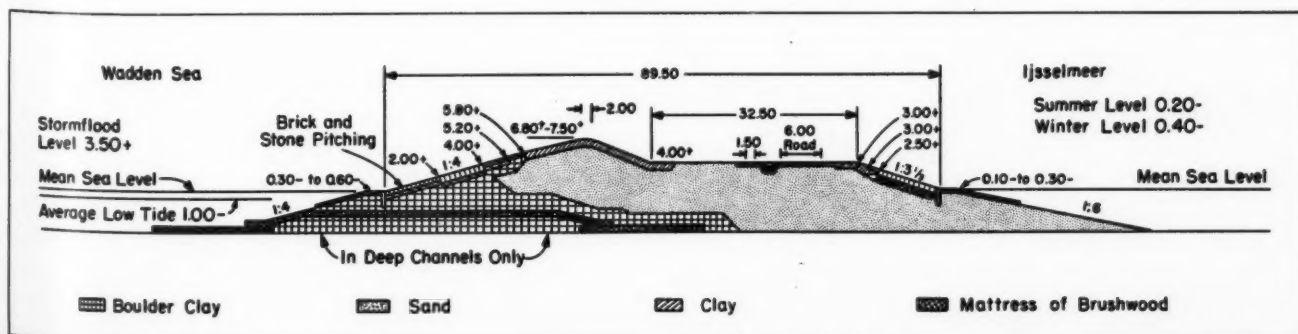
The Dutch have had to make their comeback slowly, through hard work, constantly dredging, build-

ing dikes, and digging canals. Today, Rotterdam is again one of the world's three busiest ports, and Amsterdam can be reached by way of the world's largest canal locks—large enough to take a ship twice the size of the Queen Elizabeth.

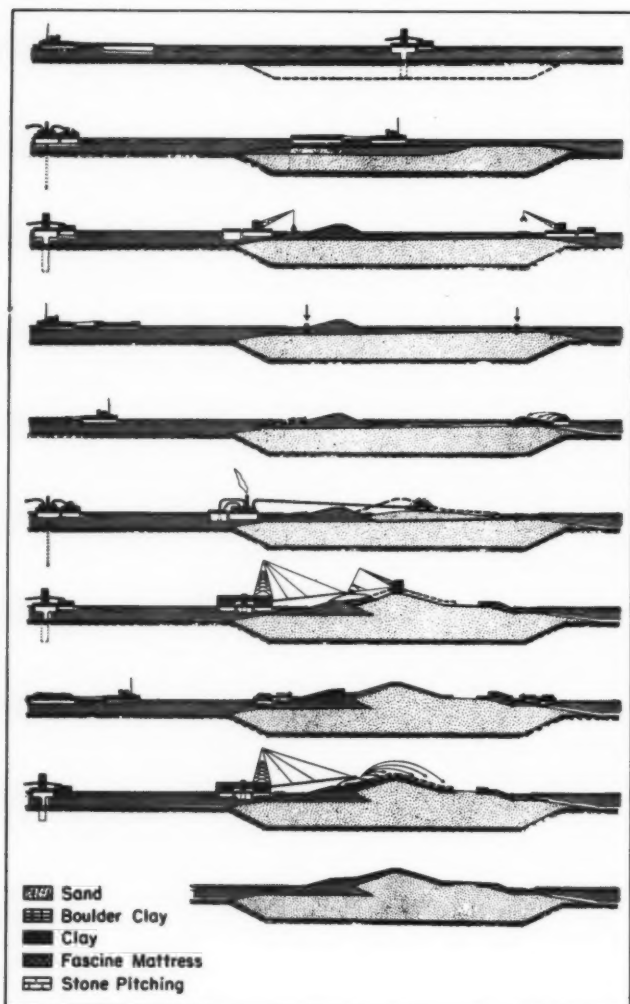
In the battle for land, Holland is now just about even with nature. Since about 1200, Holland had lost 1.4 million acres of land to the sea. By 1940, the Dutch had reclaimed about 1.3 million acres from the shore and from pumping out inland lakes.

Zuider Zee Project

Then, in 1925, the biggest reclamation project got underway. For many years an engineer named Lely had been trying to interest the government in reclaiming land beneath the Zuider Zee, the huge salt water bay that before 1300 had been a small fresh water lake surrounded by good lands. The Rhine flowed through this lake on its way to the North Sea. Lely had spent his life in trying to interest the government in reclaiming this Zuider Zee, but it was not until he had been made Minister of the Waterstaat that he began to make some progress. Finally, after three terms in office, he succeeded in having the government agree to his reclamation plan. Even



CROSS SECTION OF THE ENCLOSING DAM SEPARATING THE NORTH SEA FROM THE ZUIDER ZEE. UNITS ARE METERS.



TEN STAGES IN THE BUILDING OF A DIKE FROM DREDGING OF SOFT SEA BOTTOM TO FINISHED FORM.

then, the timing was wrong, for it was the middle of the first World War.

When the war was over, plans were revised and the first step was undertaken to close off the North Sea from the Zuider Zee. This meant the construction of a huge enclosing dike to separate the Zuider Zee and the North Sea and let the fresh waters of the Rhine flow in so that this might become a fresh water lake. It took 12 years to build the enclosing dam, the last gap being closed in 1932. This 20-mile long dam was the greatest effort ever made in the field of hydraulic engineering. As the final closure was approached, the tides sucked with such force that the sea floor was worn to a depth of over 100 feet in the gap. Filling this opening, making full use of the few minutes when the tide turned, was a most difficult feat. The job would have been even worse had not one of the workers thought of using the heavy boulder clay that could be dredged from the bottom of the Zuider Zee. Where sand and ordinary clay washed out of the gap with each tide, this heavy boulder clay resisted, and while as much as 50 per cent of it would be lost, its use did permit progress.

This 20-mile long dike rises 22 feet above mean

sea level and is 600-ft wide at its base. At its crown it is wide enough for a four-lane divided highway with plenty of width left for a double track railroad. A shipping lock, capable of passing 200-ton ships was constructed at each end of the dam. These locks are used primarily by the fishermen who once fished the salt Zuider Zee, but must now change to fresh water fishing or go out each day through the locks into the North Sea.

Fresh Water Lake

The Zuider Zee is no longer salt, so it can no longer be a Zee. Promptly, the Dutch changed the name to IJsselmeer, or Lake IJssel. It is necessary to be accurate about this sort of thing if you are Dutch. More important, the body of water was fresh, and that meant that dikes could be built within it and new polders pumped out. Plans called for the reclamation of five large polders, and the first, Wieringermeer polder, was begun even before the enclosing dam was completed. This gave 50,000 acres of good new land. Another polder, the Northeast polder, is now complete, and another 119,000 acres have become a part of Holland. In June, 1950, work began on the reclamation on a third polder, Eastern Flevoland. When it is finished, 133,000 more acres will have been added. The other two planned polders, Markerwaard and Southern Flevoland, are still but drawings on a map, but they encompass 133,000 and 111,000 acres. This means that the polders taken from the former Zuider Zee will have added about 546,000 acres of rich soil to Holland.

The Eastern Flevoland project is typical of the engineering work required in reclaiming a large polder. It was necessary to start with the construction of a 56-mile long dike extending into the IJsselmeer. Breakwaters and harbors had to be built and pumping stations and shipping locks erected. Three pumping stations were required—different, indeed, from the thousands of windmills that would have been built if the project had been undertaken 150 years ago. One of these new stations is equipped with diesel driven pumps, while in the other two the pumps are powered by electric motors.

Building a New Polder

Construction of the dike was begun in four different places. These were gradually extended until they met. In the six years since the start of this dike, this phase of the work has been very nearly completed. It is expected that within the next few months the polder will be enclosed, and pumping can begin. It will take an additional six months or so to pump the polder dry, and work then will be started on making the area a producing part of the nation. The polder will be crisscrossed with a few large drainage canals that will be connected with the IJsselmeer through locks and will serve as shipping canals. Smaller canals will flow into these large ones, while hundreds of small drainage ditches will feed the

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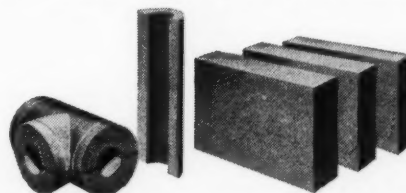
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WITH DREDGES WORKING ALL ACROSS THE ZUIDER ZEE, THE SUPERINTENDENT TRAVELS BY BOAT.

small canals. Generally speaking, water will go into the drainage ditches, thence to the small canals, on to the large canals, through the pumping stations, and into the lake. However, in the dry seasons, this process is reversed and fresh water from the lake is allowed to flow into the polder as irrigation for the crops. It is a neat system.

Then there must be roads built. This Eastern Flevoland polder will have 45 miles of primary roads and 210 miles of secondary local roads. This is a major road building project in itself, for on the soft earth, good roads are hard to build and expensive.

Then there must be cities built and farms laid out. The government undertakes this down to the last barn or henhouse. Only when a farm is ready for the farmer to go to work is it leased. Not until every house, store, school, church, and community center is completed, is a city opened to its new citizens. City planning is a major engineering study in Holland.

Dike Construction

All of this except the building of the dikes is fairly routine work that could be handled by any good engineering firm. Dike work is different. Dutch engineers admit that perhaps other engineers could accomplish the job, but not so economically. Accord-

ing to these men, only the Dutch can build dikes cheaply enough to make reclamation profitable.

When a new dike is to be constructed, the soft top layers of the sea bottom have to be dredged away and replaced with sand. Then, two dams of boulder clay are erected on each side of the dredged lane, and the space between is filled with sand. This sand is then covered with a protective layer of boulder clay. The slopes on either side below water level are protected with mattresses of brushwood sunk with riprap. Above the water level the slopes are covered with a fascine mattress made up of woven willow branches and rice straw. This mattress is covered with broken brick and small stones and then overlaid with heavy cut stone, brick, concrete, or basalt. Sometimes this stone facing is omitted; then the fascine mattress is covered with clay and sown.

Experiments have been undertaken to find some way to replace the brushwood mattresses. Prefabricated asphalt slabs were attempted, but the results were unsatisfactory. Bituminized sand has been tried as a covering for the dikes above water, and this does seem to offer some advantages. However, cost is still uppermost in the Dutch engineer's mind, and standard procedure so far has been most economical.

Materials and Equipment

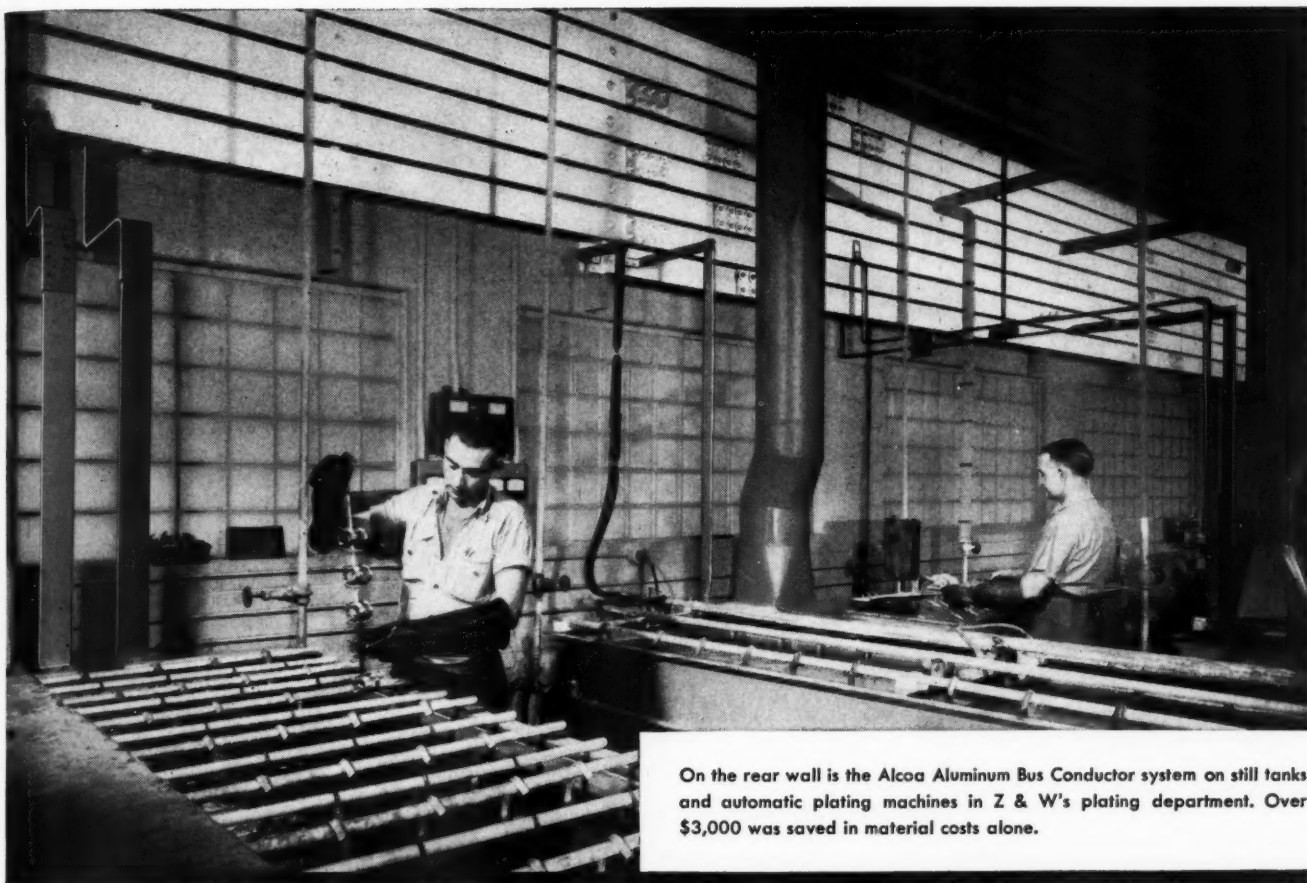
It is fortunate that most of the materials used in dike construction are found in Holland. The sand and boulder clay can be dredged from the bottom of the IJsselmeer. The brush and rice straw come from the surrounding countryside, brick is made locally, and only the cut stone must be imported—from Belgium or Scandinavia.

It takes an enormous fleet of dredges, barges, and other floating construction equipment to build a dike. The construction of the Eastern Flevoland polder has now at work 41 huge dredges of various types, 30 cranes (of which 9 are afloat), 267 barges, 79 tugs, 63 flatbottom boats, and 23 draglines. There are 2000 laborers—but only 9 trucks. Obviously, this is a water construction project.

With the completion of the Eastern Flevoland polder, Holland is back to just about even in its



A FASCINE MATTRESS MADE OF WOVEN BRUSH IS ABOUT TO BE SUNK WITH STONE AT OUTER END OF NEW DIKE.



On the rear wall is the Alcoa Aluminum Bus Conductor system on still tanks and automatic plating machines in Z & W's plating department. Over \$3,000 was saved in material costs alone.

\$3,000 IN DIRECT SAVINGS

With Alcoa Aluminum Bus Conductor at Z & W Manufacturing

When Z & W Manufacturing Corporation designed their new 130,000 sq ft plant in Wickliffe, Ohio, they wanted equipment second to none—yet costs were closely watched. One of the best of the money-saving acts took place in their plating department.

After a detailed study, they used Alcoa® Aluminum Bus Conductor to carry the 12,000-amp load from individual rectifiers to the six plating lines. Compared to a copper system Z & W got the same conductivity from half as many pounds of metal. Only difference was a slight increase in size. In installing a system using high-conductivity aluminum alloy, Z & W estimates they saved more than \$3,000 in direct material costs alone.

Easy fabrication and installation

Other important benefits and savings resulted from aluminum's light weight and easy handling. Also important was the ease of fabrication during their bending and drilling operations. The $\frac{1}{2}$ " x 6" bars were just bolted to 2 x 8's attached to the wall. Simple insulating washers and wood spacers were used.

Having some small copper bar stock on hand, they used that as leads in some places—other leads were

aluminum. Trouble-free joints between copper and aluminum were made, as were all joints, with Alcoa Electrical Joint Compound and aluminum bolts.

Saves 50% on bus conductor

The same technical advice and assistance from Alcoa that enabled Z & W to engineer, design, fabricate and install this bus system are yours for the asking. Study how much you could save with Alcoa Bus Conductor—for expansion or modernization. Cost is about half. Just check the Yellow Pages of your phone book under "Aluminum" for Alcoa's nearest office. Or write, Aluminum Company of America, 2311-L Alcoa Building, Pittsburgh 19, Pa.



THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS



Your Guide to the Best
in Aluminum Value

Stop Staring Down a Chimney



A consulting engineer can learn a lot by looking around to see what the others are doing. The best way we know is to get together with a group of U. S. consulting engineers and their wives and visit European engineers in private practice next May.

This Second Consulting Engineer's Tour will take in London, Dublin, Paris, Milan, Rome, and Madrid. Departure is by air from New York on May 11, with return from Madrid on June 9, 1957.

It will be a relaxing, enlightening business trip you can't afford to miss.

Stop staring down that chimney. The list is filling up.

Tour Editor

CONSULTING ENGINEER

227 Wayne Street

St. Joseph, Michigan

Send details on 1957 EUROPEAN TOUR

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fight with the sea. When the remaining polders of the Zuider Zee project are completed, Holland will be ahead. The work begun by the Frisians with their spades and buckets is now just being completed after almost 2500 years. As man built, the sea took away, but modern methods and equipment are winning.

Biological Balance

It seemed that nature had won a round in 1934, when the Zuider Zee was first enclosed and became fresh water. Millions of mosquitoes came to the area in a plague so terrible that every house and tree was covered with a heavy, grey blanket. It was impossible to look out of a window or to drive a car. Boys would collect fistfuls of mosquitoes and throw them at passersby as though they were dirty snowballs. The old fishermen of the Zuider Zee who had been thrown out of work as the salt water fish disappeared, looked upon this as a plague sent by God, as were the plagues of Egypt. It was wrong to change nature.

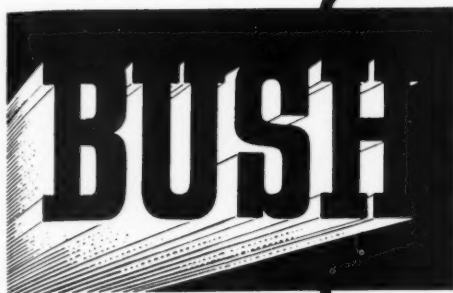
This time the problem was solved not by an engineer, but by a biologist. Since the earliest times, eels moved each year in squirming millions from the deeps off the coast of Florida across the Atlantic to the Zuider Zee where they lived to become full grown. Then they returned to the Sargasso Sea to spawn and die. When the enclosing dam had been completed, these eels waited outside the locks to get in, but the locks were opened only in the day time—and eels sleep in the day. At night the eels would try to get in, but the locks were closed. The biologist recommended that the locks be opened at night just to let the eels in. This was done. The eels entered by the millions and ate the mosquito larva. The mosquitoes disappeared, and the old fishermen went to work catching eels. All was well. A biological balance had been reestablished in the Ijsselmeer.

Ravage of Man

There will be other problems—storms, perhaps even more pests—but today the greatest danger to the lowlands of Holland is man rather than nature. In the last war, large areas were flooded because the Allies felt it necessary to bomb the dikes as a protective measure. If war comes again, more damage can be done in one hour than nature did in a thousand years. But if man has sense enough to leave ravage to nature, the engineers of Holland can handle the situation. ▲▲

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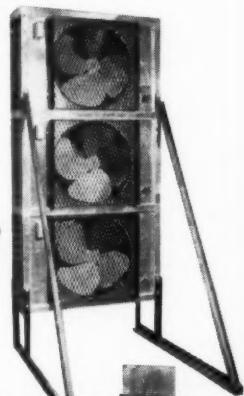
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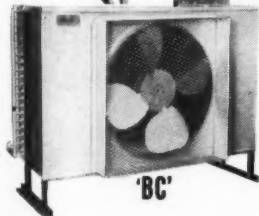
'CDT'



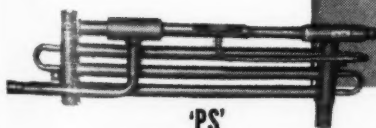
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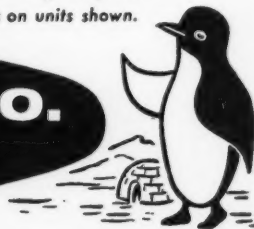
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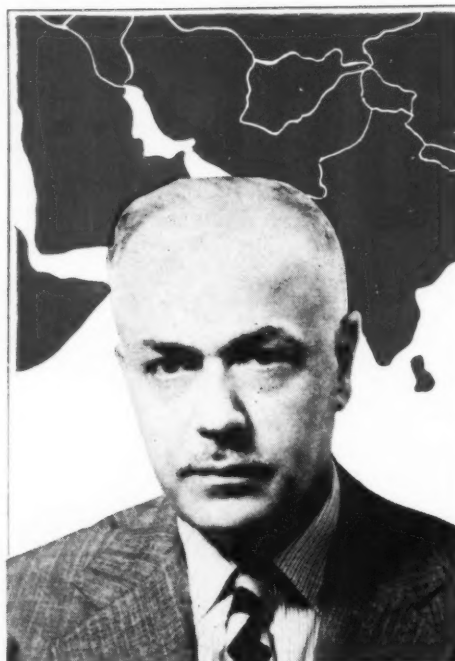
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HARRY A. KULJIAN
The Kuljian Corporation



An Engineer Looks at Foreign Aid

AS AN AMERICAN consulting engineer and president of the Kuljian Corporation, Engineers and Constructors, it has been my privilege to travel extensively in visiting our projects throughout the world. On these travels I have had the opportunity to observe the operation of our Foreign Aid Program and to note its effects on the political and business conditions of many of those foreign countries. I have talked with political and economic leaders, and I know their reactions to our aid program.

I have just returned from another long trip to India, Pakistan, the Middle East, and Europe, and on this trip I made it a particular point to study our aid program. I think it is important for consulting engineers to know what results we are getting for our tax monies, and I would like to offer some suggestions that would make it possible for us to get more from the money we spend. It seems to me that consulting engineers should be personally concerned with our foreign aid projects, for so much of the money is going to help build up the less industrial areas of the world, and consulting engineers are involved in these activities as part of the practice of our profession.

Background of Foreign Aid

As a result of the destruction during World War II, a tremendous amount of rehabilitation had to be undertaken to clear cities, rebuild railroads

and highways, and provide new public utilities and manufacturing plants. The United State Government realized the necessity for this type of work and hurried to aid European countries under the Marshall Plan. This was one of the finest efforts that we, as Americans, could have undertaken, for it was necessary to put these distressed countries back on their feet. The Marshall Plan did its job well and has come in for very little criticism even from those who oppose foreign aid of any type. It was necessary to feed the hungry people of Europe and provide them with funds whereby they could re-establish their industry. It is agreed that the Marshall Plan was an emergency measure that aided Europe economically and aided us politically in preventing many of the countries that leaned toward Communism from actually falling into that chasm.

Following the Marshall Plan, the department handling foreign aid changed so that it became the Point 4 Program, the FOA, the MSA, and now ICA (the International Cooperation Administration). As the initials changed, so did the objectives of foreign aid, and emphasis has shifted from Europe to the less developed areas of the world. Currently, the ICA has thousands of men in foreign countries whose job it is to help in educational, sanitation, and agricultural programs. They also have industrial people whose job it is to assist in the industrial development of the areas.

I am convinced that our country is generous

in its objectives and that these efforts are high moral attempts to improve the lot of the people of the world. Without education, sanitation, a sound agricultural economy, and industry of a type that suits the area, no country can hope to feed its people, and without food in their stomachs, there can be no peace and contentment in their lives.

These ideas are excellent, and they are in accordance with all high moral and ethical tenets. There can be no doubt that our efforts are the most humanitarian that have ever been taken to make this world a place to live in peace and happiness. However, merely because our intentions are good, we have no guarantee that the results of our efforts are equally excellent.

It is necessary to study the United States Foreign Aid Program step by step to see how it goes about its job, what the results have been, and what the foreign countries receiving the aid think of us.

Educational Program

We have sent to the less developed countries experts in the field of education. It is their job to set up schools and help educate both children and the uneducated adults. In studying this aspect of the work, I am of the opinion that a good job is being done. The educators who have been sent

abroad seem to get along well with the educators of the foreign nations, and results prove that much is being done to eliminate illiteracy. However, this is a long range program that will take many years. Those who are taught in one or two years to read and write then must go on through the lower grades and into high schools and colleges. A country with a high percentage of its population illiterate cannot become an educated nation overnight.

Agricultural Aid

Our aids to agriculture have been extremely successful. Our experts have taught these primarily agricultural people the way to do more effective farming. They have been shown ways to mechanize farming and have been taught the benefits of fertilizer, crop rotation, and all of the other developments of modern agriculture. They have been taught by our expert land classifiers to spend money and develop promising ground and to avoid pouring money into ground that is not worth either the money or the effort.

Public Health Work

Progress is also being made in the field of public health. Sanitation, of course, is one of the primary problems, and our public health officials have been



KULJIAN SAYS U.S.-FOREIGN OWNERSHIP IS PARTIAL ANSWER, HIS INDIAN OFFICE HAS INDIAN PRINCIPALS IN FIRM.

extremely valuable to these people in showing them what they needed in the way of water supply, sewerage disposal, and other health matters. They have distributed medicines where needed to stop serious outbreaks of disease, and they have taught the people the basic principles of healthful living.

We might say, then, that our efforts in education, agriculture, and public health have been generally successful. Also, I feel that the people of these countries appreciate this aid. These three fields of endeavor touch them very closely, and when an adult learns to read, a farmer learns how to operate a tractor, or when the village is sprayed with DDT, these are all personal enough contacts for the people, individually, to appreciate the efforts of the donor and feel a closeness.

Industrial Development Lagging

Unhappily, I must report that we have done nowhere near so good a job in industrial development. There is a difference here. All of our experts in all fields must deal with the politicians and bureaucrats of these nations in making our contribution to them. This is not so difficult in education, agriculture, and health, for the objectives are clear and there is general agreement. Industrially it is a different matter. Here politics really enters the picture. In those nations there are bound to be differences of opinion as to which industries should be built up first, which should be government owned, and where the factories should be erected. This, and similar problems, causes great bickering and delay among the local politicians. Our industrial men, supplied by the ICA, make recommendations to the planning boards and then sit back and wait for decisions. These planning boards work for month after month trying to come to some sort of agreement among themselves. Our industrial men in the ICA sit by and wait, giving perhaps a little help here or there—but very little is asked for, and advice given without request does more harm than good. Even the most enthusiastic ICA expert who has to put up with this type of bickering and lack of decision, soon loses interest in his job and gives up trying to fulfill his mission.

Personnel Complications

The general personal history of a mission man goes something like this. A young government employee is sent to India, for example, to aid in setting up a paper mill. He is enthusiastic about the job, and while he may not know too much about paper mills from a technical point of view, he gathers what information he can and heads for India to be of service. As soon as he gets there he makes the necessary political contacts, offers his services, and sits back to wait. In a few weeks a member of the planning board comes to him with a technical question. While the ICA man is quite good at industrial management, let us say, he does not know the technical

process for producing the sulphite necessary for the paper mill. Yet it is a technical question that the planning board asks, so the ICA man wires Washington to try to get the answer. When he gets the material needed, he finds that the planning board is no longer interested in this, but is working on another aspect. After a series of frustrations, the ICA official finds that about all he has to do is to sit in a local bistro and talk to other Americans.

After a few months of this, a regular routine of living is established that centers primarily around finding some way of entertaining oneself while waiting for the planning board to make some decision. The once dedicated official is now a part of the "American set" who spend most of their time in the cafes and nightclubs, behaving in a manner that might seem quite all right in the United States but is out of place in the East.

As I had pointed out to me in India, "You sent us for a century only religious missionaries who taught us that the quiet, calm, sober life was the type admired most in the West. Now you have, since the last war, sent us only those who seem to be trying to disprove this."

As a result, we do not leave a good impression in the foreign countries, and in addition, we send a good man to a foreign land, but when he comes back to this country he is quite a different person.

Socialistic Menace

However, there is an even worse result of the way in which we give our foreign aid money for industrialization of the industrially backward foreign country. The money goes from our government directly to their government. Their government then has the choice of loaning this money to private individuals for the development of privately owned industry, or they can use the money to establish a government owned industry. In all too many instances, the money is going to government owned industries, and even where it goes to private enterprise, it is not infrequent for the government to nationalize that industry and take over the manufacturing organization as soon as they discover that it is profitable. Therefore, it becomes clear that we are giving our money to these foreign governments in order that they might establish nationally owned industry. We are defeating private enterprise in these foreign countries while here at home we stand as the champion of private ownership. This inconsistency simply does not make sense.

At the same time that we are setting up socialized industries with our own money, we also are doing harm to our American manufacturers. All too often the money expended for equipment goes to European equipment manufacturers. These European manufacturers are famous for offering "free" engineering along with the sale of their products, and they are able to convince the foreign bureaucrats,

and incidentally also convince many of our ICA men, that since their price appears to be cheaper that they should get the orders. Therefore, using our own money we have encouraged and supported European manufacturers over our own manufacturers, while establishing government owned industries. The result is political, economic, and commercial foolishness.

Recommended Solution

I do not believe it is right to criticize without giving some suggestion as to how the difficulties can be overcome. In this particular instance it seems rather obvious. We do not want to encourage government owned industries—certainly not beyond public works such as hydroelectric power plants, sewerage and waste disposal plants, or waterworks. If we are giving money for textile, rayon, fertilizer, or general chemical plants, or for iron and steel mills, and if we do believe in private enterprise, then our money should go in such a way that it will assist private enterprise and not a socialistic economy. Certainly, we do not need to aid German or even British or French industry as of this moment against our own industrial exports. They are doing enormously well without our passing along to them orders coming from our foreign aid money sent to the Middle East or the Far East or South America.

Instead of giving money we should give machinery and technical advice with the stipulation that this machinery go only to private enterprise. The new adjunct to the World Bank designed to lend only to private enterprise is a step in the right direction, but we would do even better to supply the orders for equipment and machinery and for technical services rather than supply the money for the purchase of this equipment and these services. Some of our World War II surplus is being sent abroad under the ICA program, but not nearly enough, and the orders for new equipment are too often going to foreign firms. And we should certainly receive assurances and formal agreements from all foreign countries receiving our aid that money and equipment being sent to them for private enterprise is not to be nationalized in the foreseeable future.

Joint Ventures

Our government is overlooking another form of aid that would be of mutual value to our country and to the foreign country and, without question, would encourage private enterprise. The way to really build up these countries industrially—and on the basis of private initiative—is to construct industrial plants financed by American and foreign investors. If Pakistan or India wants to build a paper plant, for example, the best answer would be to finance that plant partly by American capital and partly by Indian capital. That would supply the foreign country with the capital needed, the technical

design work, and the knowledge of operation that is necessary to assure a successfully run plant. Everyone concerned would profit.

Kuljian Experience

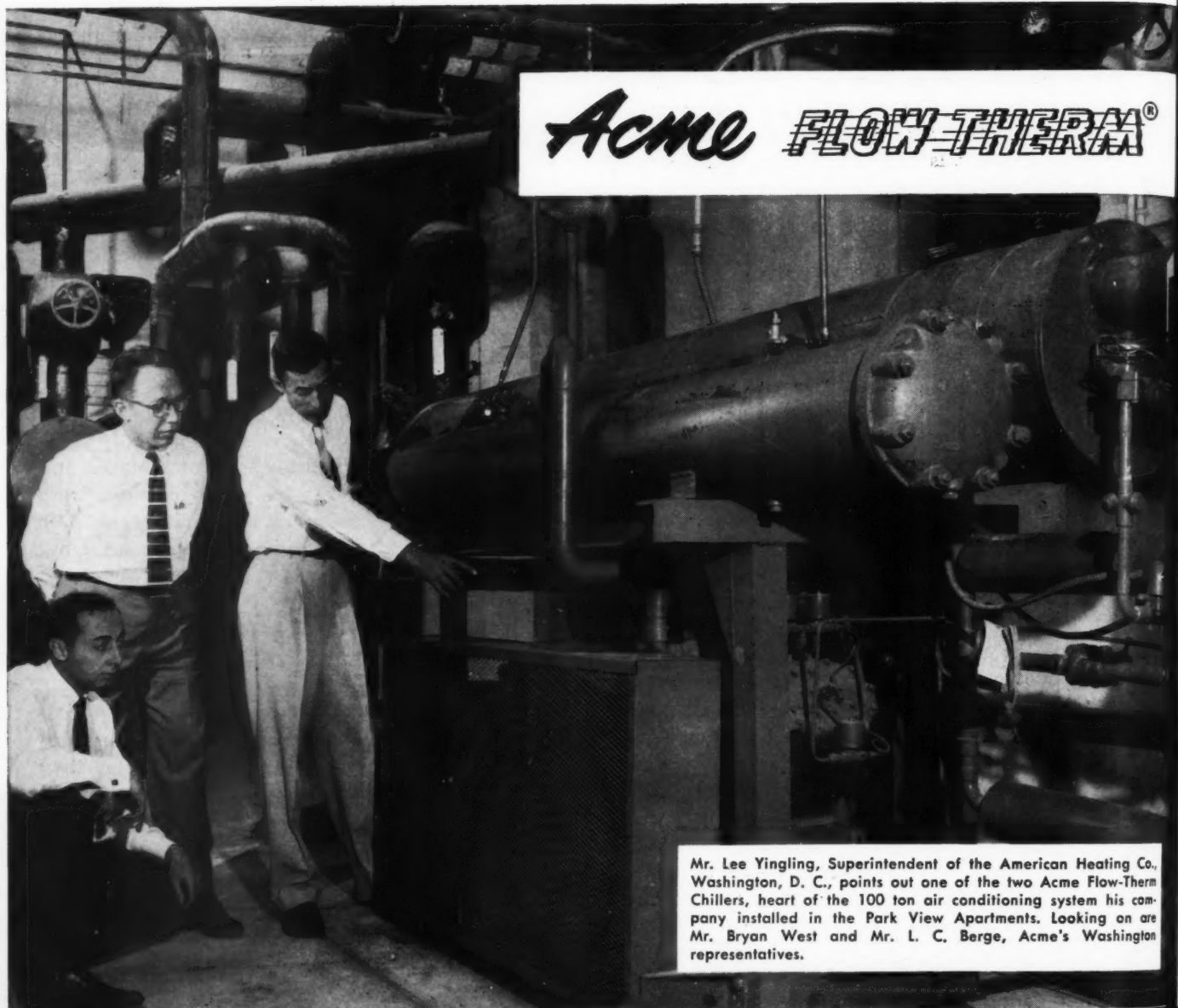
I know that this system works, for I am doing it myself. We have offices in India, Pakistan, and Iraq, all of which are operated as joint ventures with local engineers. In every instance we hold a slight majority of the stock, but this is at their suggestion rather than mine. I will gladly reverse this position at any time that they feel that they can get along without our having the majority vote. Under these arrangements we are training engineers who will, in a few years, be as good designers and constructors as any in this country. They are men who will be perfectly capable of operating their own offices, and I am encouraging them to set up their own private practice—with our technical assistance—whenever they feel that they are able. There is no doubt in my mind but that this is a good foreign aid method and that it only needs encouragement to involve the investment of many millions of American dollars in the building up of those countries.

Investment Incentive

It is true that few American manufacturers are anxious to invest money abroad in a country they consider politically unstable. Our government could handle this easily. I believe that if the government were to allow a tax exemption of 5 or 10 percent of corporate profits invested in approved foreign industries, we would soon have a foreign aid program greatly surpassing the one we now have and without additional burden to our government. Furthermore, we would be encouraging private rather than socialized industry, and we would be disseminating our technical knowledge in the finest way possible. By encouraging American industries to invest in American-foreign corporations, under a tax exempt scheme, we could practically eliminate the industrial aid of ICA and yet get immediate results in the way of industrial development of those countries with a corresponding increase in their standard of living and their purchasing power.

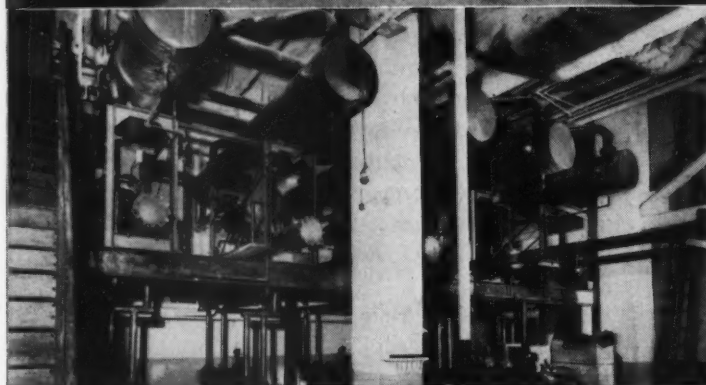
U. S. Consultants Can Help

No scheme such as this is as simple as it might sound in roughly sketching it on paper, but it can be worked out in a sound legislative manner. I am going to do everything I can to get this concept before my Congressmen and I am hopeful that my fellow consulting engineers will see the advantages of this plan and will aid me by calling their own Congressmen. Industrial development of any area is a professional duty of every thoughtful consulting engineer, and I hope that calling the attention of my own profession to this plan will be the best beginning for a worthy project. ▲▲

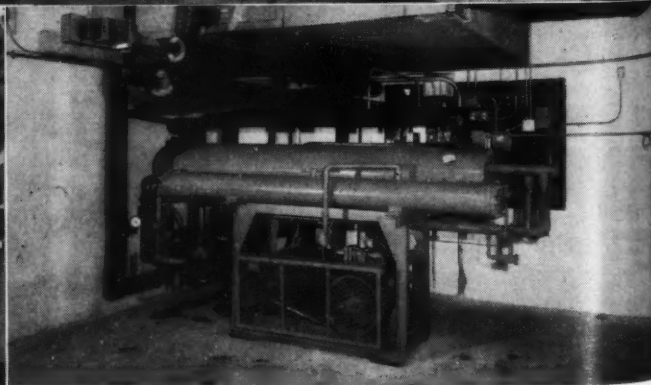


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Mr. Lee Yingling, Superintendent of the American Heating Co., Washington, D. C., points out one of the two Acme Flow-Therm Chillers, heart of the 100 ton air conditioning system his company installed in the Park View Apartments. Looking on are Mr. Bryan West and Mr. L. C. Berge, Acme's Washington representatives.



MULTIPLE INSTALLATION — Five 100 HP Flow-Therm Chillers provide the Merchants Bank Building, Indianapolis, Indiana, with 500 tons of air conditioning. This system was engineered and installed under the supervision of Mr. John Beaulieu, Illingsworth Construction and Engineering Co., Indianapolis.



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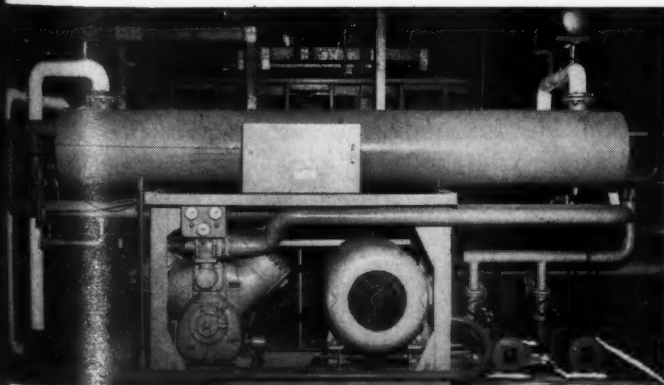
With Acme you get a more complete range of models, with capacities to fit exact job requirements. This is possible because the Flow-Therm's chief components, famous Dry-Ex Chiller and Shell-and-Tube Condenser, can be tailor-made to match compressor performance exactly—combine operating economy with maximum capacity. The Flow-Therm is the most completely engineered packaged unit in its capacity range. All controls—electrical and mechanical—are supplied complete and ready for simple installation. When you buy an Acme Flow-Therm Packaged Chiller, it arrives on the job completely assembled, ready for connection to power and liquid lines.

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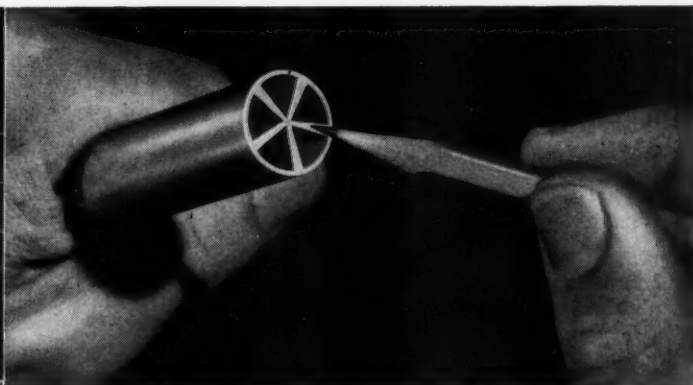
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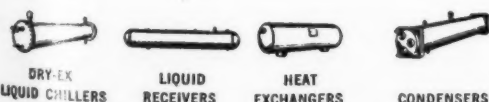
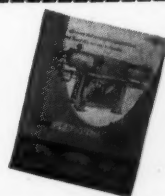


PROCESS COOLING INSTALLATION—This 100-ton Flow-Therm Packaged Chiller and a Dry-Ex fluid-to-fluid Heat Exchanger is cooling Zinc Cyanide Plating solution at Ford Motor Company's Sandusky, Ohio plant. Installation was handled by Udyline Corporation under the supervision of J. K. Rawsthorne, Sales Engineer for J. Geo. Fischer & Sons, Detroit, Mich.



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Report From London

WALTER SEKULES

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CONSULTING ENGINEER

MOST OF ENGLAND'S leading consulting engineers are members of their professional organization, the Association of Consulting Engineers. Constituted in 1913, the Association now has a membership in excess of 400 engineers, located all over the world. Its principal functions are the maintenance of professional rules and practices, the representation of consulting engineers vis-a-vis the government and other professional institutions, the drawing up of model forms of agreement and scales of fees, and, in collaboration with other appropriate organizations, establishment of conditions of contract. The Association elects a chairman once a year, the titular head of the organization, who is assisted by a full-time secretary. Current chairman is Mr. V. A. M. Robertson, C. B. E., M. C., P. P. I. C. E., M. I. Mech. E., M. I. E. E. Colonel C. W. G. Walker, C.M.B., D.S.O., is secretary. Governing body of the Association is a Council of eighteen members—twelve from London and six country members. Each year, four London and two country members are elected so that each serves for a period of three years. Committees and subcommittees are appointed as required to consider specific problems affecting consulting engineers and their organization.

Activities of the Association range widely. Together with the Export Group for the Constructional Industries, it has sponsored "Conditions of Contract for Overseas Work Mainly of Civil Engineering Construction." These conditions, it is hoped, will be made the basis of internationally accepted standards through the Federation Internationale des Ingenieurs-Consueils (FIDIC), an organization representing consulting engineers in most West European countries. Object of the new conditions is to define for the benefit of prospective clients in underdeveloped countries in Asia and Africa the duties and responsibilities of clients, consulting engineers, and contractors when drawing up agreements.

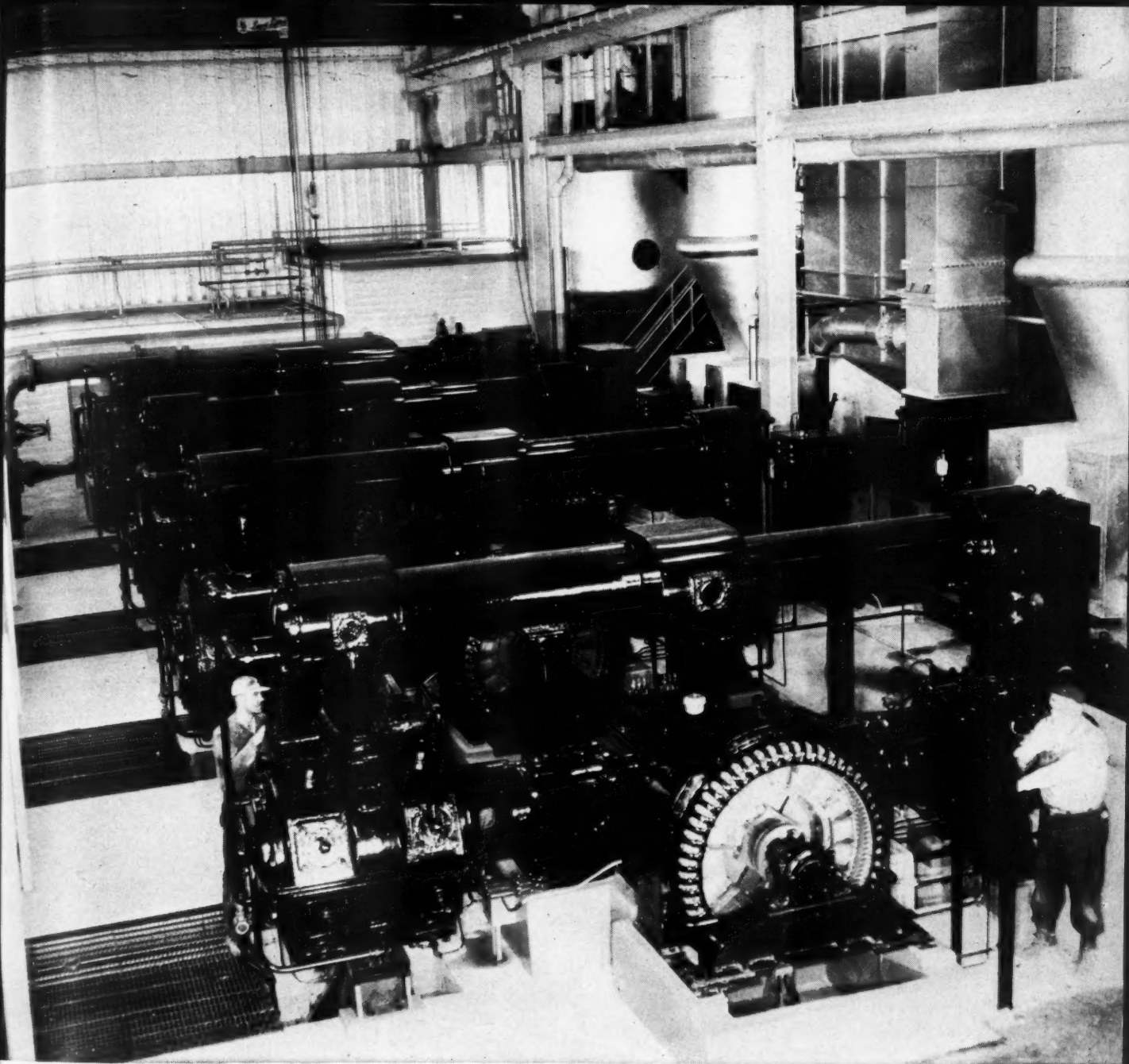
The Model Agreements Committee has been working on a new form of agreement for work on behalf of the British Ministry of Transport and Civil Aviation. Agreement has been reached, and the new model form is being tried out for an initial two-year period to see how it works.



The Association's chairman has visited the World Bank in connection with its compilation of a Registry of Engineers. He reported that the Bank is now making full use of consulting engineers where required. In England, the Association has been arranging the training of engineers on the staffs of electrical consulting engineers in nuclear power work. It feels that consulting engineers should be employed on major nuclear projects to ensure that they have the experience and trained staff to undertake this work when called upon.

The Association is the senior organization of its kind in the British Commonwealth, and many of its members in England have offices abroad. Consulting engineers in these countries may not have an organization catering to their specific interests, and, if qualified, they often join the British Association. Thus, it has members working in Australia, New Zealand, West Indies, Canada, Hong Kong, Burma, Ceylon, India, Malaya, and East, Central, and South Africa. One member is a U.S. consulting engineer. Sometimes in a country where the Association has a large enough number of members, an advisory committee is set up as a link between the local members and headquarters in London. When these groups become strong enough, local associations of consulting engineers may be set up independently. This has happened in South Africa where a flourishing organization, the South African Association of Consulting Engineers, of about 40 members, is now in existence. In Rhodesia and East Africa it soon may be possible to have local advisory committees.

Relations with other professional institutions of engineers are held to be very important. In its statement of aims and objectives, it stresses that it does not seek to encroach in any way on the functions of



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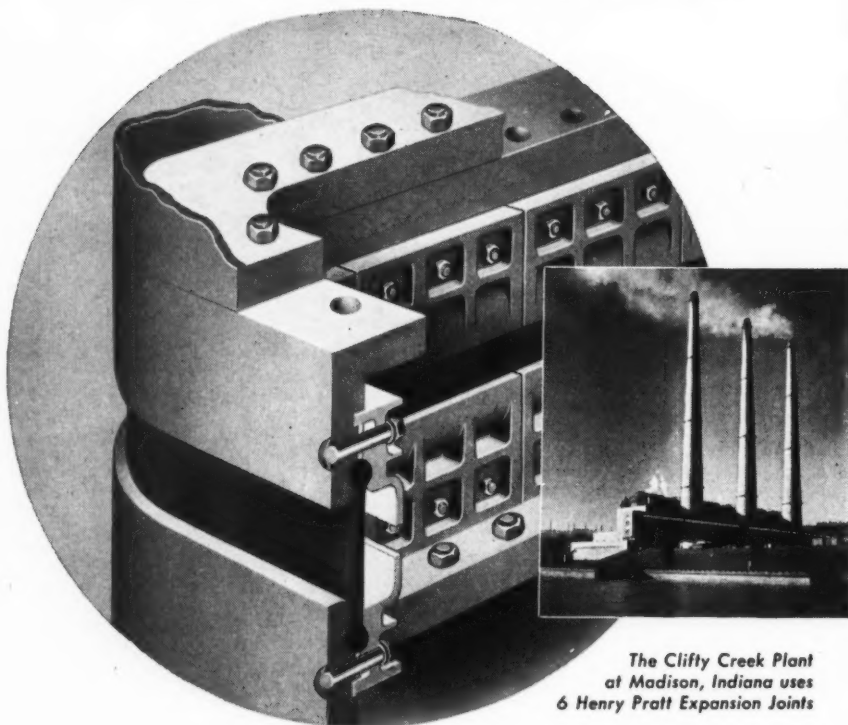
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K.6.6

WORTHINGTON



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Expansion Joints

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the councils of the leading engineering institutions. In fact, it insists that each of its members be a corporate member of one of these institutions as evidence of his technical skill and scientific knowledge. Another important condition of membership is the requirement that members must be in practice as consulting engineers, either individually or as a partner or consultant of a firm of consulting engineers. No member may be connected with any firm carrying on a contracting or manufacturing business dealing with the class of work to which his practice relates.

Functions

Perhaps the best explanation of the functions and standing of the British Consulting Engineer comes from the association itself: The first and primary duty of the consulting engineer, it says, is to safeguard the interest of the client and to insure a sound engineering job at minimum cost. Long experience has shown that this can be achieved only if the contractor as well as the client has confidence in the impartiality and fairness of those responsible for the design and supervision of the job. There are two risks to guard against: first, actions by the contractor to the detriment of the client — such as excessive costs or inferior work; and secondly, though not so common, unfair treatment of the contractor by the client, such as failure to pay legitimate claims or the issue of unwise, misleading, or contradictory instructions. It is to avoid such difficulties that there gradually has been evolved the client-consultant-contractor relationship which long experience has proved to be extremely effective. In this relationship the consultant stands between client and contractor and insures efficient and fair treatment of both parties as well as the best possible engineering advice.

Scales of fees are recommended by the Association of Consulting Engineers. Two methods are usually adopted. Where a survey or general advice on a project is required before commitment to large capital expenditure, a retaining fee is usually paid in addition to

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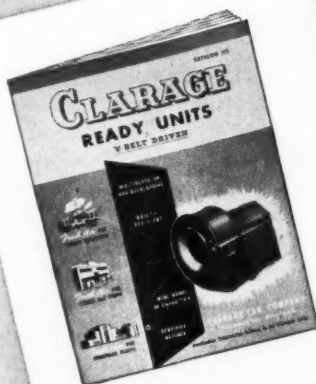
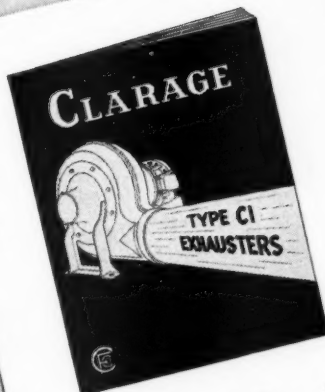
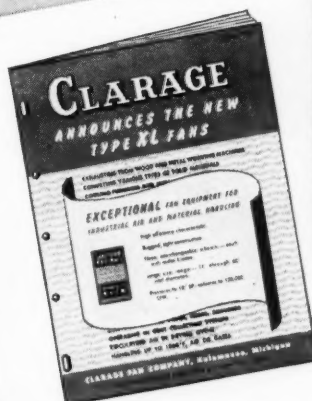
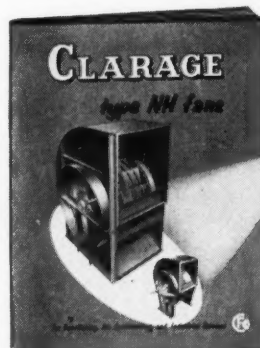
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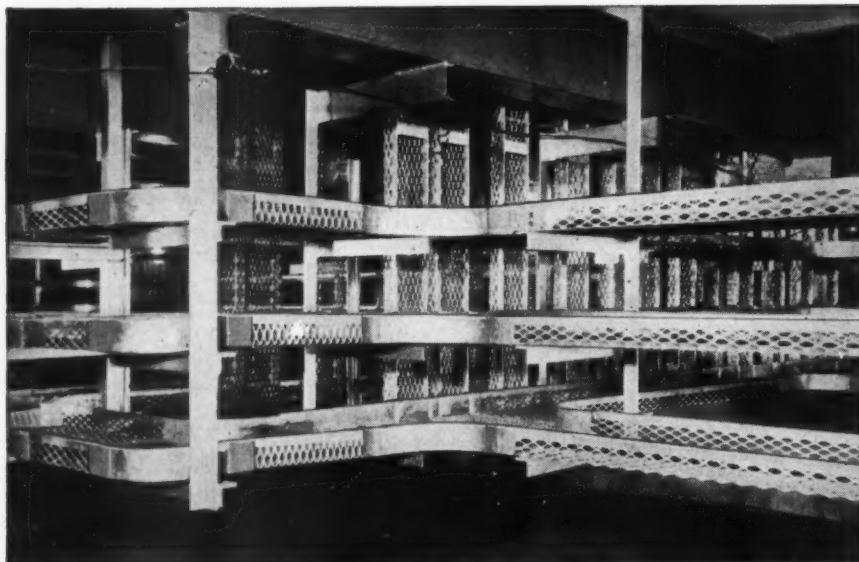


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Cope Cable Trough at Kansas City Power & Light Company's Hawthorn Station.

Kansas City Power & Light Adopts Cope Cable Trough

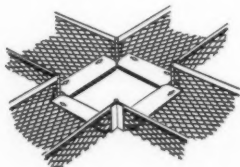
Kansas City Power & Light Company engineers installed versatile Cope Expanded Metal Cable Trough for cable supports in the modern Hawthorn Station. Forward looking engineers in utilities and industry everywhere are building modern distribution systems with Cope Cable Trough.

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time and expense charges on the consultant's standard scale. Alternatively, if the nature and duration of work can be specifically defined, payment may take the form of a fixed fee. Secondly, where constructional work is concerned, the fee is usually based on a percentage of the capital cost of the proposed project.

Recommendations

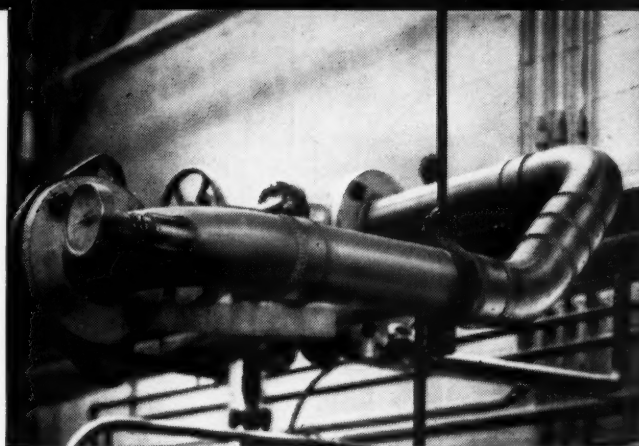
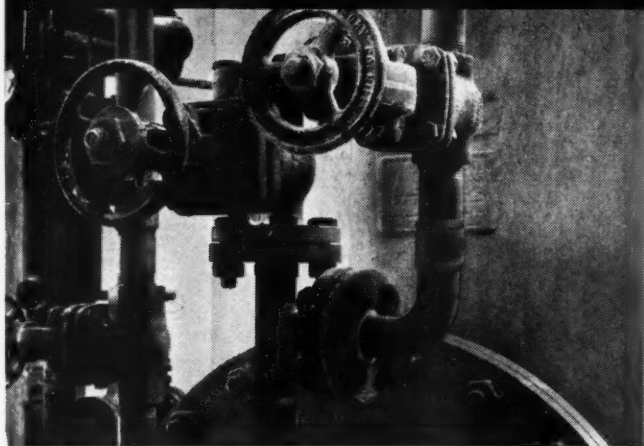
Finally, the Association of Consulting Engineers in London undertakes the very important task of recommending suitable consulting engineers for specific projects planned by prospective clients. Consulting engineers in England are prohibited from advertising their services. Yet, given the increasing complexity of engineering work, firms of consulting engineers have been tending to specialize. To help government departments and industrialists anxious to obtain the services of a consulting engineer, the Association is in a position to recommend appropriate consultants whose qualifications and experience would suit them for any particular project. This service is available in any country of the world through the medium of the offices of the United Kingdom Government Trade Representatives.

Committee Selections

When a request for a recommendation is received by the Association, a committee of three, headed by the president, makes a study of the professional history of the members and selects the firms it feels are best qualified for the job. The only limitation is that the committee cannot recommend its own firms. This puts a great responsibility on the committee, and it indicates that the members have considerable faith in the honesty and fairness of their officers — for the system has worked well so far. The general practice of consulting engineer associations in other countries is to send prospective clients a copy of the association roster and let them make their own selection. The fact that the British Association can use this more selective system is a tribute to British standards of fair play. ▲▲

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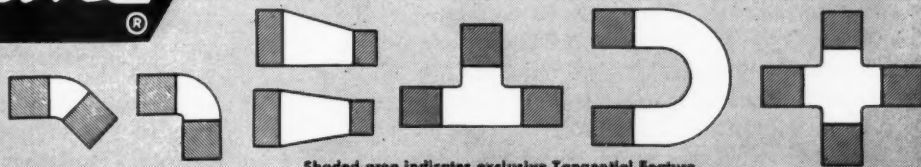
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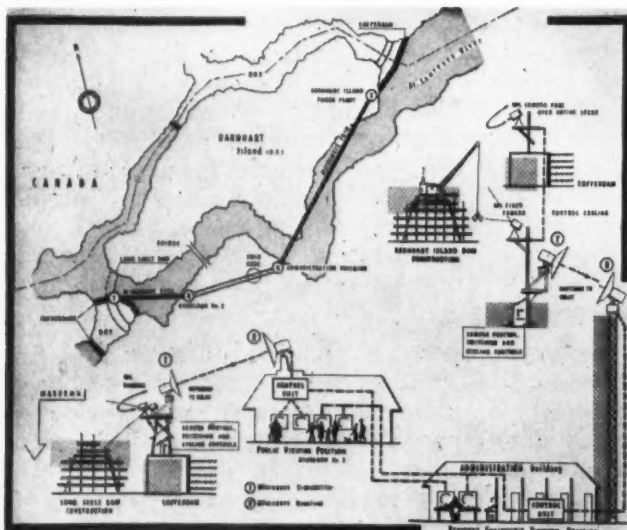
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News for the Consultant

St. Lawrence Power Project Supervised With Television

Television is being used to supervise work on the two dams under construction by the Power Authority of the State of New York and the Hydro-Electric Power Commission of Ontario at the St. Lawrence Power Project at Massena, N. Y. Observation of the television screens saves hours of travel to the construction sites at the 3230-ft Barnhart Island Power Plant Dam and the 2350-ft Long Sault Dam.

The television system consists of General Precision Laboratory cameras to scan the dams and Raytheon KTR television microwave relays to transmit the television signals more than three miles to the resident engineer's office. At both the Long Sault and Barnhart Island dams, two GPL cameras are used. Each installation has one fixed camera that looks across the entire dam site and another camera, equipped with a telephoto lens, that slowly scans an



DRAWING SHOWS CAMERA LOCATION AND SIGNAL PATHS.

arc of approximately 120° . The fixed cameras are on for 30 seconds and alternate with the scanning cameras which have a one minute cycle. The television signals from the cameras are transmitted by microwave relays to the administration building where the resident engineer watches two television receivers that continuously monitor the entire project. The resident engineer is in contact with the work sites by two-way radio and can route supplies, equipment, and manpower as needed.

Raytheon microwave links are used rather than co-axial cable for transmitting the television signals



since the path of the signals must cross water at several points and cable would either have to be buried or hung on poles. This would be unsatisfactory because of the possibility of accidental damage while maneuvering large construction equipment. If necessary, the location of the Raytheon units may be altered.

Preliminary Report Submitted On Milwaukee Waterworks Expansion

A long term waterworks expansion program to be recommended for the city of Milwaukee will cost some \$50 million, as indicated by a preliminary report by the Kansas City engineering firm of Black & Veatch. The firm is scheduled to submit, about Dec. 1, a complete report on its study of Milwaukee's long-term water needs and means of financing construction of the facilities.

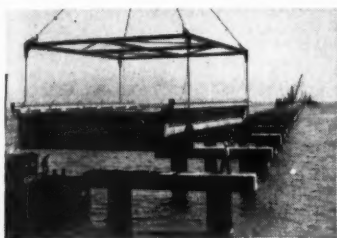
The preliminary report indicated the city probably would have to seek a second 25 percent increase in water rates. An initial increase of that amount was authorized earlier this year by the State Public Service Commission. If the city should issue \$50 million worth of revenue bonds in the next five or six years to cover new water system construction costs, the original 25 percent increase would not provide sufficient revenue to cover the interest and principal payments on the debt.

Among items to be included in the expansion are a complete water plant on the city's south side, construction of a number of new feeder mains, several reservoirs, and booster pumping stations.

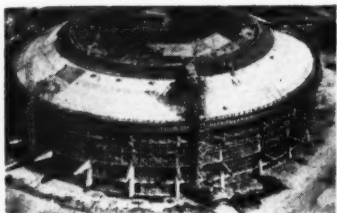
Instrumentation Planning for Future Generating Stations

Centralized control for steam-electric generating stations offers the advantages of greater power production per employee and improved performance during start-up and emergencies.

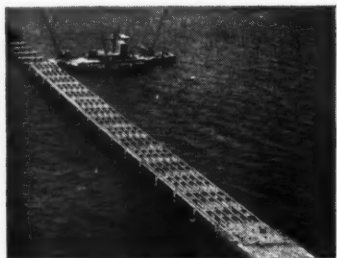
Potential savings through more economical loading of today's units are sizeable, and will be far



Lake Pontchartrain



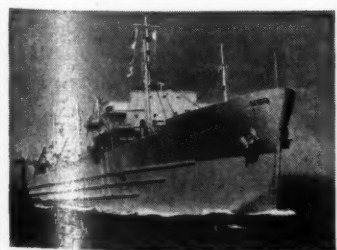
Havana Stadium



Sunshine Skyway



Kitimat Dock



Concrete Ships

What Feature* Is Common to Each of these Outstanding Concrete Structures?

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- 1956 — **Havana Sports Stadium** — 286' thin shell dome with prestressed ring girder — Professor J. Vila and The Preload Company, Inc., Consulting Engineers
- 1955 — **Hampton Roads Project** — 2 miles of prestressed beam spans and prestressed piles — Parsons, Brinkerhoff, Hall & McDonald, Consulting Engineers
- 1954 — **Sunshine Skyway across Tampa Bay** — 3½ miles of prestressed beam spans — Parsons, Brinkerhoff, Hall & McDonald, Consulting Engineers
- 1953 — **Bridge at Heilbrun, Germany** — 353 foot span, world's longest prestressed span — Dr. Moersch, Consultant
- 1952 — **Office Building, Glenn L. Martin Co.** — 3 story precast, prestressed members bolted into place — Engineering Dept. of Glenn L. Martin Co., and The Preload Company, Inc.
- 1949 — **Walnut Lane Bridge, Philadelphia** — First large prestressed bridge in U.S. with a span of 155 feet — Engineering Dept. City of Philadelphia, The Preload Company, Inc. and Professor G. Magnel, Consultants

FLOATING CONCRETE STRUCTURES

- 1955 — **Tappan Zee Bridge, New York Thruway** — 6 buoyant boxes to support 80% of the weight of the main piers — Madigan-Hyland, Captain Emil H. Praeger, Consulting Engineers
- 1954 — **Kitimat Dock, British Columbia** — Cast on side and rotated 90° by shifting ballast — Frederick R. Harris, Consulting Engineers
- 1952 — **Pier 57, New York City** — 3 buoyant boxes with a total displacement of 73,000 tons floated 38 miles to permanent position at 15th Street, in New York City. Madigan-Hyland, Captain Emil H. Praeger, Consulting Engineers
- 1946 — **Floating Drydock, Uruguay** — longest in the world
- 1943-44 — **Floating Drydock Program, U.S. Navy** — 13 large docks with a capacity of 2800 tons, and 2 smaller docks with a capacity of 400 tons
- 1942-45 — **Concrete Ship Program** — 125 ships and barges built for U.S. Maritime Commission during World War II

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greater in the future as generating-unit sizes increase and transmission systems become more complex, according to P. S. Dickey, president of Bailey Meter Co., Cleveland, in a paper presented at the fall meeting of The American Society of Mechanical Engineers. He recommended dividing the instrumentation into three groups:

¶ Instrumentation needed to guide operators, designed for maximum reliability, suitable for actuation of automatic controls, and including necessary indicating and recording devices to guide operator during normal, start-up, and emergency operation.

¶ Data gathering and analog-type processing equipment for precise performance determination.

¶ Instruments transmitting to scanning devices designed to accomplish any desired objective from simple fault analysis to complete detailed performance testing of major units and auxiliaries.

This splitting of instrumentation offers such advantages as: simplifying the control center; permitting the gathering and processing of precise performance data outside the control center; and facilitating the direct and continuous sending of incremental cost data to the load dispatchers for economical loading of the system.

This arrangement would also eliminate the need for a large Results Department since the data processing equipment would prepare permanent continuous records of unit performance, and complete test data could be taken and interpreted continuously during early stages of operation.

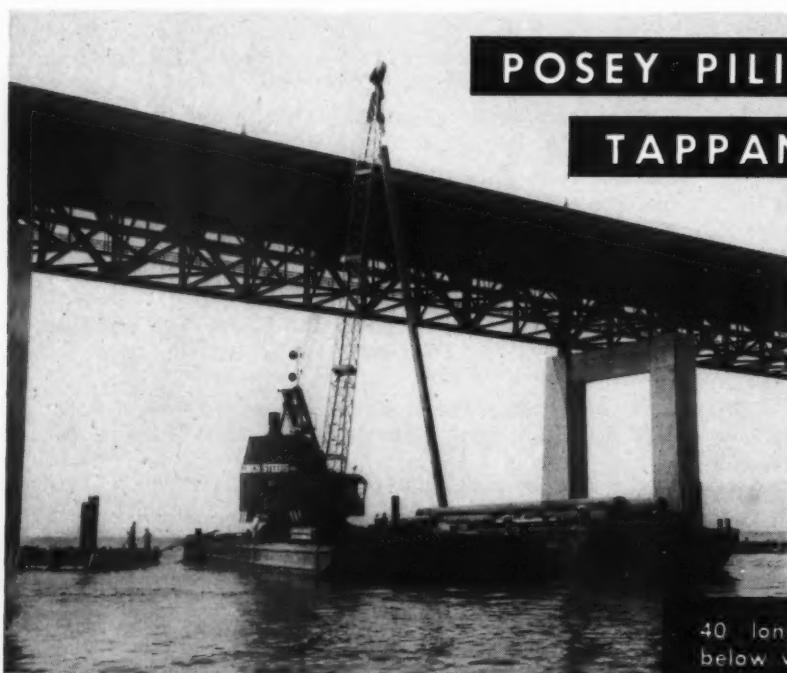
New Engineering Techniques Necessary for Reactor Vessel

The 235-ton reactor vessel for the Shippingport, Pa., atomic power plant, completed and shipped in September by Combustion Engineering, Inc., "involved pioneer work all the way," according to Joseph V. Santry, chairman of Combustion. The steel walls are 8½ in. thick, it is 31 ft 3 in. high, with an inside diameter of 9 ft 1 in.

The vessel is designed to withstand a 2500 psig internal pressure at 600 F. At rated load, 26 million lb of primary coolant water will enter the vessel per hour through four inlet nozzles and pass through the core where the temperature will be raised from 507 to 542 F. In addition, the vessel will contain thermal shields, a core assembly, and other equipment having a total weight of 100 tons.

It was built by assembling sections of the heaviest clad plate ever rolled by Lukens Steel Co. and by developing special welding, machining, and heat-treating techniques. Accepted formulas for determining stresses and thicknesses were not applicable because of the unusually thick plate and forgings involved. In addition to pressure and thermal stress due to start-up conditions, consideration had to be given to heat generation in the vessel wall resulting from neutron and gamma ray flux.

Since the hot primary coolant water will be corrosive, internal portions of the vessel are clad with ¼ in. minimum thickness of stainless steel. The hem-



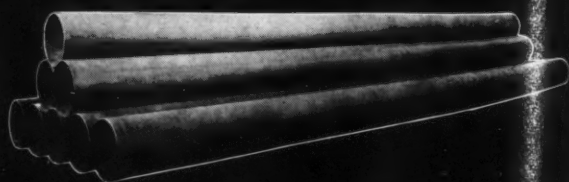
POSEY PILINGS HELP PROTECT TAPPAN ZEE BRIDGE PIERS

Posey Pilings . . . 52' long, 30" O.D., ½" wall . . . have been driven deep into the bed of the Hudson River to protect the piers of the New York Thruway Tappan Zee Bridge from the destructive pounding of floating ice and debris.

Posey is equipped to meet your requirements in pipe and piling from 20" diameter and larger. Budget and delivery agreements rigidly observed. Write for prices and specifications without obligation.

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40' long 30" O.D. ½" wall Posey Piling below was fabricated for off-shore oil well drilling platforms in the Gulf of Mexico.

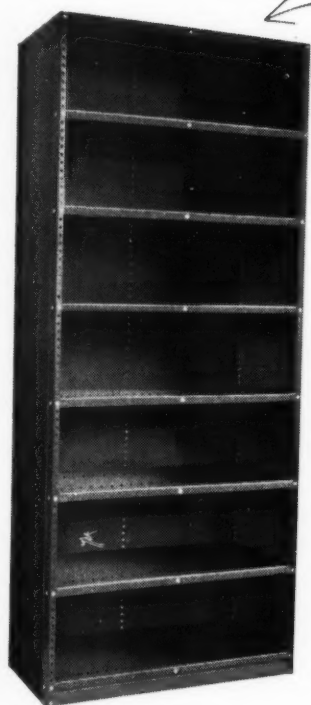


POSEY IRON WORKS, INC.

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New York Office: Graybar Building

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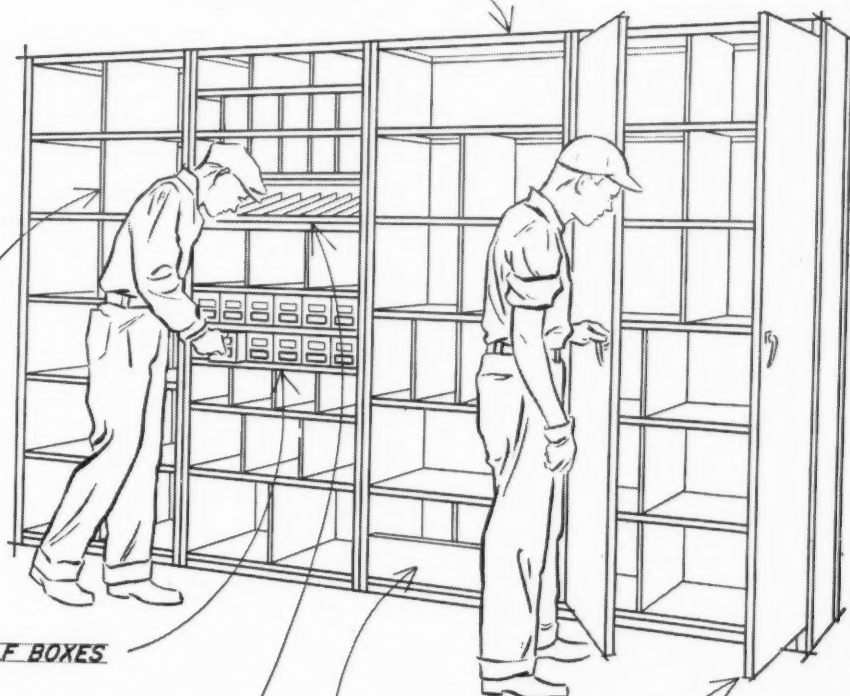
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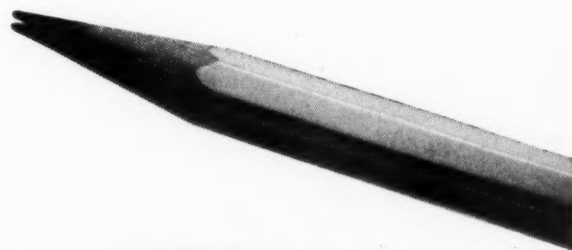
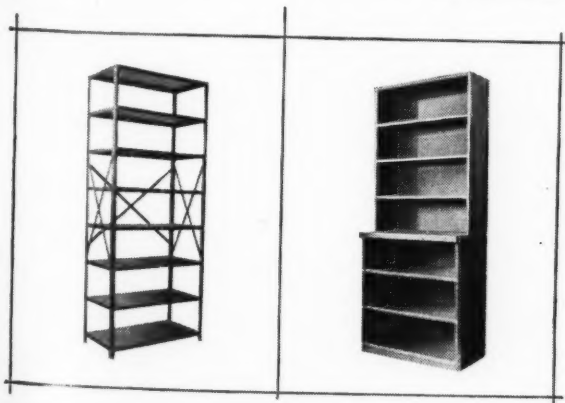
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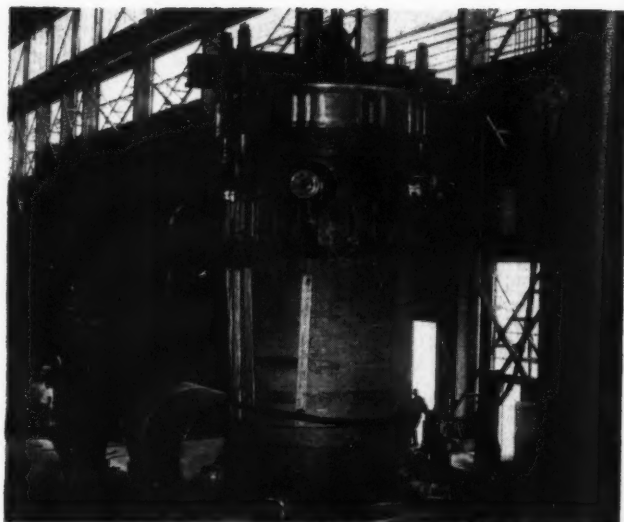
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 STANDS AND CABINETS • DRAWERS, DRAWER TIERS • STEEL CARTS • SHELVING**

ispherical bottom head and shell courses were fabricated from manganese-molybdenum clad plate of 6 in. and 8½ in. minimum thicknesses respectively. The head and shell flange forgings with a 24 in.-square cross section and the 10 in. thick hemispherical portions of the removable head were unavailable with the stainless steel integrally clad. In order to clad these thicker sections, a special device was developed at the Chattanooga shops of Combustion.

The stainless steel clad plates were examined over each square inch by the ultrasonic method of inspection for both integrity of bond and backing plate. The manganese-molybdenum steel forgings, made by Bethlehem Steel, are the largest ever produced.

Welded joints were radiographed with a 15 million v betatron, a machine so sensitive that it can detect a defect no larger than a ⅛ in. length of a standard toothpick in a 10 in. weld deposit. All clad surfaces were inspected with a dye penetrant fluid. Backing plate surfaces were inspected with a magnetic particle tester to insure freedom from defects. Optical methods were used to align matching machined surfaces. Over-all fabrication time involved a period of 16 months.

Because of the weight, large physical dimensions, and accuracy of machining required for reactor vessels of the type fabricated for the Shippingport Station, new facilities had to be installed by the Chattanooga Division. A special bay, 80 ft wide and 360 ft long, built to handle heavy components for nuclear



VESSEL WILL BE MOUNTED IN THIS POSITION.

work, is equipped with a 250-ton crane located 62 ft above the floor and another 75-ton crane on a lower level. A 170-ft extension is under construction.

Larger welding machines for long and girth seam welds were engineered and built by Combustion to receive and process work of unusual weight and dimensions. The know-how of metallurgists, welding specialists, and engineers was pooled into the development of equipment to apply stainless steel

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*Dependable quality
since 1863*

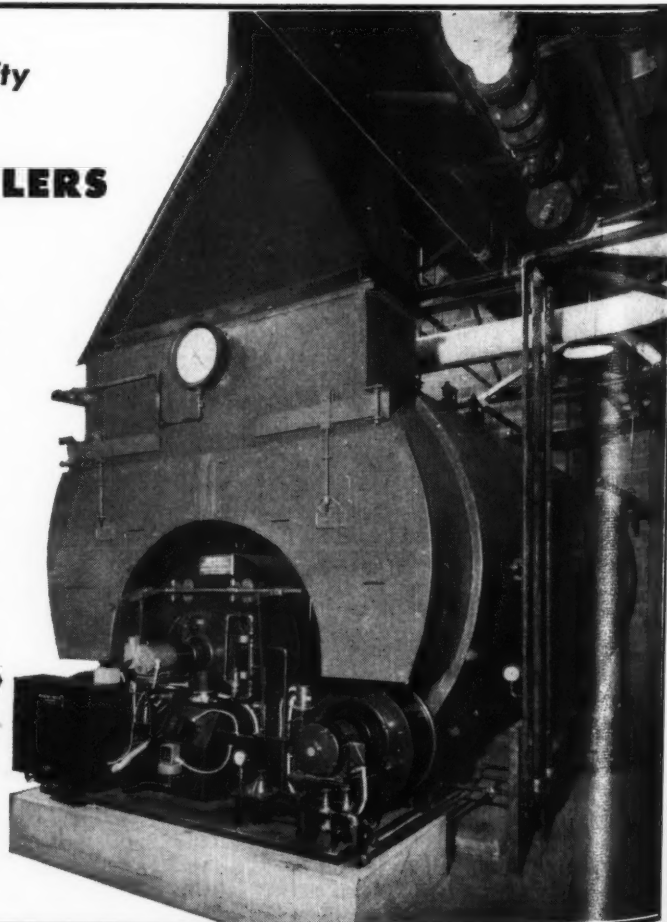
POWER BOILERS

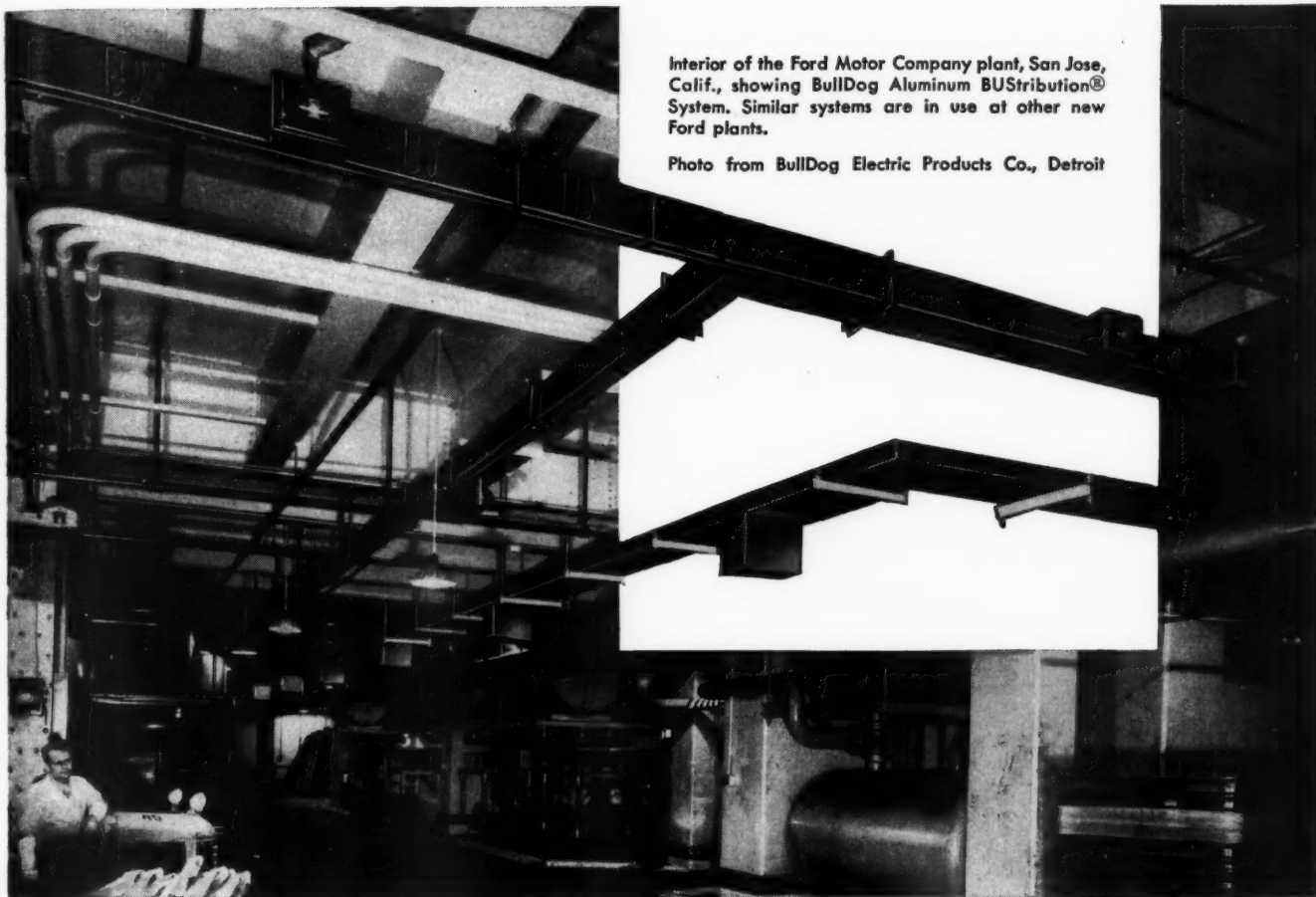
Throughout 93 years, Farrar & Trefts has been a leader in boiler design and construction. Today, as in yesteryear, F & T offers dependable, efficient, modern power boilers to satisfy the ever-increasing demands of institutional, apartment, office and industrial buildings. Under the same BISON brand, F & T also furnishes low-pressure boilers for heating purposes.

Proper selection of a boiler for the continuous delivery of required heat and power is a precise project, demanding the systematic approach of engineers long trained in this work. Engineers at F & T have this background of service and they welcome opportunities to evaluate the needs of boiler users.

Standard F & T Super Scot Power Boiler (150 lb. design pressure) with "Indiana Pack" burner at Mastic Asphalt Corp., South Bend, Ind. Furnished by Page Associates of Chicago. The Austin Co. were the Engineers and Contractors.

FARRAR & TREFTS DIVISION
ADSCO INDUSTRIES, INC.
20 MILBURN ST. BUFFALO 12, N. Y.





Interior of the Ford Motor Company plant, San Jose, Calif., showing BullDog Aluminum BUStriction® System. Similar systems are in use at other new Ford plants.

Photo from BullDog Electric Products Co., Detroit

FORD INSTALLS BUSWAYS USING 1,500,000 POUNDS OF ALUMINUM CONDUCTOR

Installation costs less, provides more power per pound of metal. System is more flexible and operates with no increase in voltage drop or temperature rise over comparable copper system.

Since 1951, Ford Motor Company has been equipping its new plants with aluminum bus distribution systems. These include plants at Detroit, Chicago, Buffalo, Cleveland, Louisville and San Jose.

By switching to aluminum, Ford diverted more than 3 million pounds of critical copper to other uses. And Ford acquired a distribution system at lower cost.

Because aluminum is lighter, Ford received

more conductor per pound of metal . . . put less weight on the building superstructure.

Because aluminum costs less than copper, Ford received more conductor per dollar invested.

And these prefabricated conductors make a neat, safe, flexible installation that brings power to the job in any amount at any location. They can be readily moved to meet new power demands. Standard fittings, tools and methods are employed.

For more information on these modern packaged plant distribution systems, contact your nearby Alcoa sales office. Or write Aluminum Company of America, 2303-L Alcoa Bldg., Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value



THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS



DO YOU HAVE A FRIEND

Who Is Qualified to Receive **CONSULTING ENGINEER**?

If you have a friend — or know someone in your own organization — qualified to receive **CONSULTING ENGINEER** free — but not now receiving it, send us his name.

QUALIFICATIONS ARE:

1. He must be with a consulting engineering firm engaged in private practice.
2. He must be a *registered* engineer.
3. His duties must include specification or purchase, or influence upon specification or purchase, of equipment and materials.

FILL IN FRIEND'S NAME AND MAIL

CONSULTING ENGINEER, 227 Wayne St., St. Joseph, Mich.

Name

Company

Title in Company

Company street address

City State

cladding to plate surfaces and flanges used for the vessel, resulting in improved production methods.

Two ¼ scale steel models of the PWR vessel were fabricated and tested to verify the stress levels in areas of structural discontinuity. The vessels were subjected to internal pressure, and strain gage readings from over one thousand strain gages were recorded and converted into stress. External forces and moments were applied to the inlet and outlet nozzles, and strain gages recorded the response of the shell to the external loadings.

A full diameter test vessel has been constructed and this vessel will be subjected to a series of tests to further substantiate the design calculations. Thermal cycling tests will be performed to establish rates of start up and shut down to establish other basic information concerning thermal response of the shell.

As a result of the design, development, and manufacturing experience on the reactor vessel, it is anticipated that new criteria and new formulas will be standardized to facilitate future design of this type of equipment.

Highway Building Products To Be Shown To Engineers

The **STEELMOBILE**, a custom-built trailer holding an exhibit of municipal and highway building

WRITE TODAY FOR
OUR NEW CATALOG

MODEL CT-711

CONCRETE TESTING AT THE JOB SITE SAVES TIME

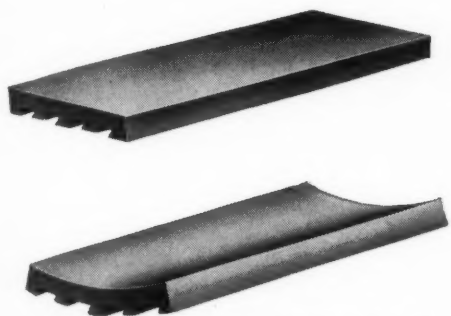
The CT-711 CONCRETE TESTER, compact and portable, brings laboratory testing precision to the field. It is an entirely self-contained unit without electrical or pressure connections. A large direct reading dial indicates results of the hand operated tests.

**CUBES • CYLINDERS • BEAMS
CAPACITY TO 200,000 POUNDS**

SOILTEST
Incorporated

4711 WEST NORTH AVENUE • CHICAGO 39, ILLINOIS

Amvit CLAY LINER PLATES *resist abrasion* *provide smoother flow, added protection*



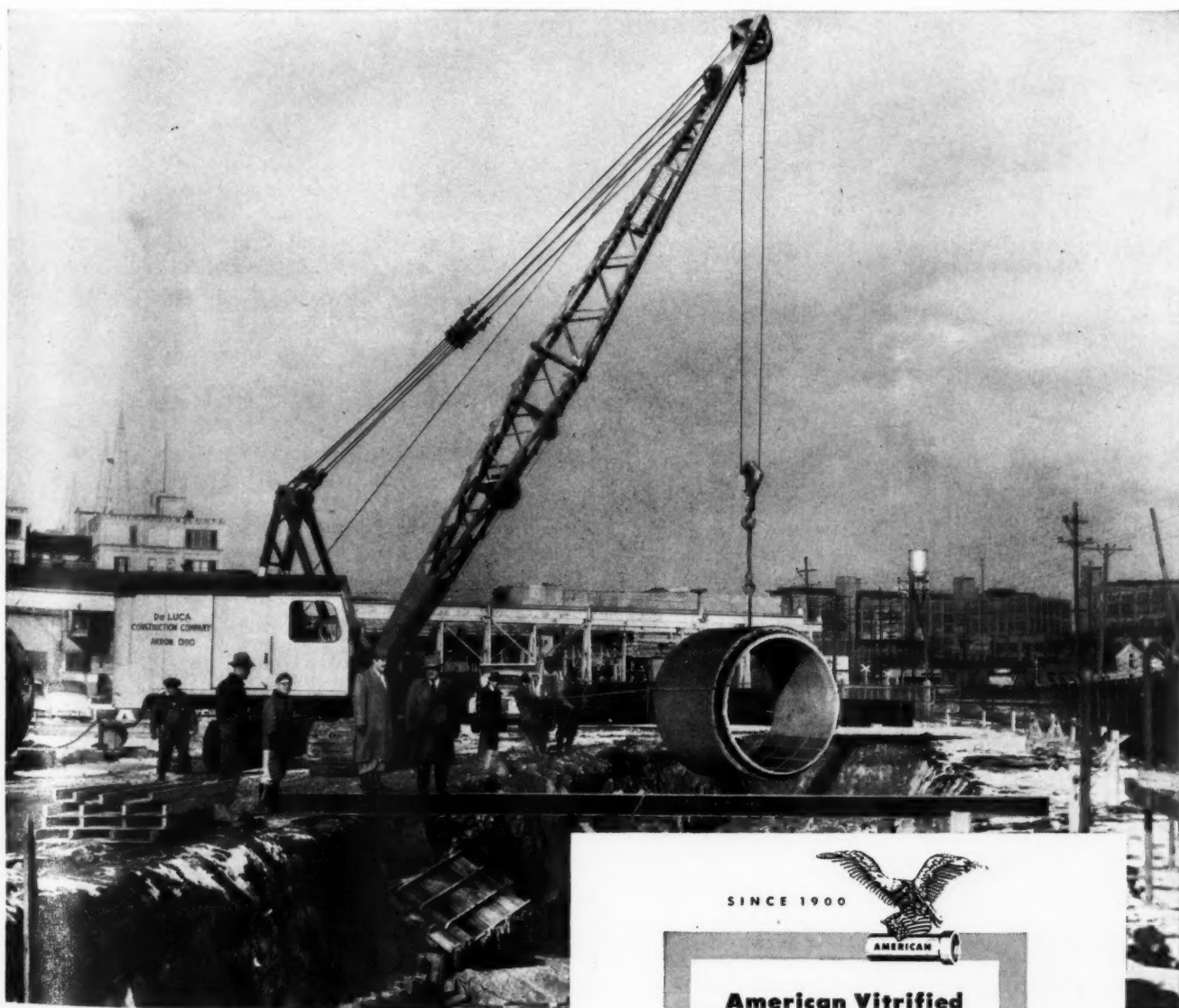
Standard size 9" x 24"
Other sizes upon request

● For *complete* protection of concrete pipe sewers, industrial sewers, culverts, acid vats, sewage treatment tanks, neutralizing baths and laboratory and industrial walls and floors choose and use *Amvit* clay liner plates.

They are specially manufactured to meet all application requirements which entail resistance to acids, alkalis and chemical reaction.

Amvit clay liner plates, hardened, glazed, smooth, acid-proof and durable, permanently bond and lock to masonry and concrete work. They install easily to concrete forms and are sized according to standardized specifications for uniform spacing.

For more information, write or call for our detailed booklet on Amvit liner plates. American Vitrefied Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.



102" reinforced concrete pipe lined with Amvit curved clay liner plates being installed in a combination storm and sanitary sewer.

MANUFACTURERS of: Clay pipe, flue liners, clay liner plates and concrete pipe.

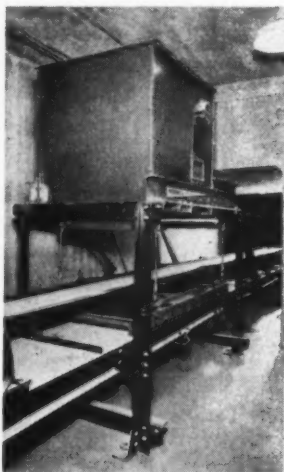


Plants Across the Nation...Brazil, Indiana • Chicago, Illinois • Cleveland, Ohio • Crawfordsville, Indiana • Detroit, Michigan • East Liverpool, Ohio
Fenton, Michigan • Grand Ledge, Michigan • Lisbon, Ohio • Los Angeles, California • Milwaukee, Wisconsin • South Bend, Indiana • Uhrichsville, Ohio

NOVEMBER 1956

Automatic In-Transit Weighing by MERRICK!

WEIGHTOMETER*



World renowned continuous automatic conveyor scale. Automatically weighs and totalizes the flow of material passing over a belt conveyor. Adaptable to an existing conveyor — easy to install—simple to maintain —suitable for control of auxiliary equipment — high weighing accuracy.

*Reg. U. S. Pat. Off.

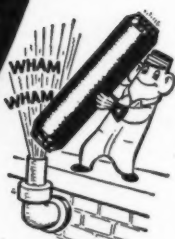
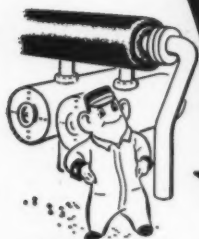
Bulletin 375 on request

MERRICK SCALE MFG. CO.
PASSIAC NEW JERSEY

STOP

NOISE from air, steam and gases discharged to atmosphere

PULSATION in pipelines created by surges from engines, compressors, blowers, etc. with



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They are engineered to effectively correct your specific noise and pulsation problems. You will profit through better neighbor and employee relations and avoid compensation claims.

Write for full information.

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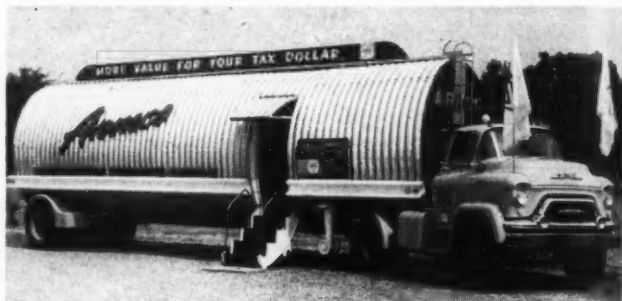
Sound Engineering

763 East Park Avenue, Libertyville, Illinois
Dallas, Texas

products manufactured by Armco Drainage & Metal Products, Inc., has started on a 50,000-mile, 16-month tour of U.S. cities. Consulting, municipal, state, and county engineers will be invited to view the exhibits in each city.

The trailer itself is made of a corrugated stainless steel sewer pipe, 35 ft long, 8 ft wide, and 12 ft high. Rear bumper and rub rail were formed from Armco highway guard rail.

Products on display include: metal plank for the flooring of bridges; bin type retaining walls that keep



STEELMOBILE WAS FABRICATED OF SEWER PIPE.

steeply sloped ground from moving; steel sheeting for holding back earth in trenches and other excavations; foundation piling for preventing unequal settlement of buildings and bridges; liner plates for holding up earth in tunnels or for lining existing tunnels; water control gates to prevent backflow at

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AND THE CONRAD HILTON

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Newest
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Air-Conditioned Rooms Available

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UNDER ONE
ROOF

Rooms
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Special
Family and
Group rates

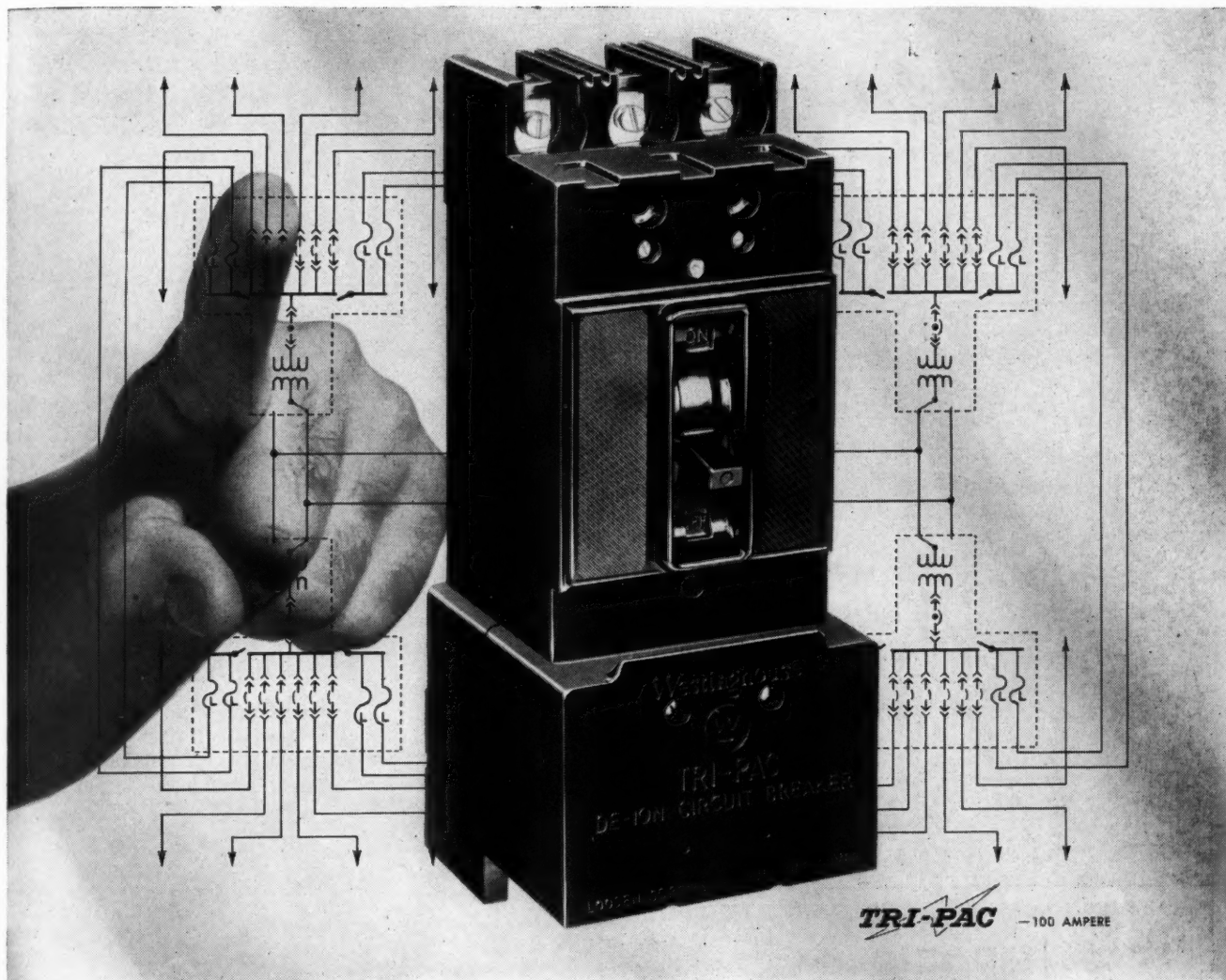


STEP

RIGHT FROM YOUR CAR
INTO THE HOTEL LOBBY

PARKING





100,000 amps gets a new boss— the Westinghouse Tri-Pac breaker

The new Westinghouse Tri-Pac breaker is the smallest protective device for electrical circuits where 100,000 amps can be poured into faults. It is the most practical and economical solution to the constantly increasing interrupting requirements of network systems and those fed by large transformers.

Co-ordinated triple circuit protection—thermal, magnetic, and current limiting—combines the inherent advantages of both the molded case breaker and fusible current limiters. The breaker trip portion of the Tri-Pac handles overloads and moderate faults, eliminating fuse replacement. On higher currents, the cur-

rent limiters in Tri-Pac trip before the breaker portion, insuring the prompt protection required at high currents.

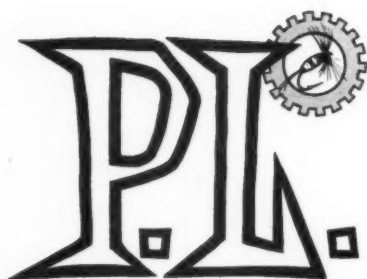
Tri-Pac costs much, much less than large air current breakers of equivalent rating and provides more safety and convenience than switches combined with fusible elements. New Tri-Pac breakers insure positive protection against all system current faults—large or small—at a new and greater economy.

A Westinghouse sales engineer can show you additional reasons why the new Tri-Pac breaker is your best buy for powerful circuit system protection. Call him, today.

J-30216-X

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WHERE BIG THINGS ARE HAPPENING FOR YOU!



Pleasant Living is your business and personal bonus in Colorful, Industrial Colorado, the state that meets industrial and individual requirements! Documented facts are offered for your study. Write for free, revised-to-the-minute analysis, "Industrial Colorado."

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19 STATE CAPITOL
DENVER 2, COLORADO



*P.L. ...a product of
Colorado Climate*

Examples of a few typical circuit plans.

HERE'S HELP!

Patented SEALED-PIN CHAIN DESIGN keeps abrasives out—quadruples chain life.

COMPRESSED NEOPRENE WASHERS

Hapman TUBULAR CONVEYORS

Move almost any flowable material—wet or dry—through any plane or angle . . .

Make big savings! Move bulk materials automatically—up, down, through walls, around corners and obstacles with a Hapman! Circuits like these or complex layouts engineered to your needs. Usually a single drive unit serves where other conveyors need several. Design cuts costs. Dust and liquid tight!

WRITE for Circuit Bulletin and Catalog CE-116

Hapman CONVEYORS, INC.
DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO MICHIGAN
In British Commonwealth & Europe: Fisher and Ludlow Ltd., Birmingham

Also builders of famous Dutton Boilers.

sewer outlets; guard rail for general highway use and for barriers on dead-end streets, traffic dividers, and similar uses; and prefabricated steel buildings. Balance of the exhibit shows the full line of Armeo drainage pipes.

Use of Actual Cases Urged For Teaching Ethics in Schools

The use of actual and not hypothetical ethical cases is the answer to the problem of ethics instruction in engineering colleges, according to Dr. J. C. Freund, Dean of the College of Engineering, University of Detroit. Speaking before the Fall General Meeting of the American Institute of Electrical Engineers, he requested engineers to send to him problems of ethics that they have encountered or of which they have personal knowledge. The Committee on Ethics of the American Society for Engineering Education is assembling such cases to provide subject matter for college courses in engineering ethics.

Dr. Freund pointed out that the use of real cases as a basis for instruction has the support of the great majority of those qualified to judge and that although some faculty members of engineering colleges are opposed to moral instruction, most educators feel responsible for teaching ethics to their students but disagree on how to go about it. ▲▲

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400 outside rooms with bath. Large-screen television and radio at no extra charge in every room. Air conditioning. Finest dining room. Atlantic 1-6970

Hotel Pittsburgher MOTEL

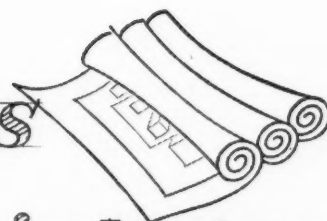
Opposite Greater Pittsburgh Airport on Airport Parkway west. 56 air-conditioned rooms with large-screen television at no extra charge. Tile bath. Private phone. Restaurant facilities. Courtesy car to and from airport.
AMherst 4-5152

a Knott Hotel

JOSEPH F. DUDDY, GEN. MGR.

HOFFMAN'S ENGINEERED SYSTEMS

*designed to do
the tough jobs in industry*



STRIKING ADVANCE IN MATERIALS CONVEYING WILL BRING NEW EFFICIENCY, SPEED, SAFETY TO YOUR OPERATIONS!

Things are moving in the materials handling field. Especially since the development of the double-damper valve. This valve already has multiple applications, and fresh ones are being discovered all the time. Some plants use the valve to feed dry materials *into* a conveying system; in other plants it discharges materials *from* a system. All materials passing through the valve are delivered in uniform, measured batches.

Air appliance engineers had been striving for years to perfect a valve of this kind, which would constitute an effective air-lock between the high-pressure differential inside a pneumatic conveying system and the atmospheric pressure outside. Now they have succeeded. And the number of purposes to which the valve can be put in industrial conveying is enormous.

The double-damper valve represents a new concept in fast, accurate, *safe* conveying. It is now possible—in fact, simple—to move materials that are explosive, fire-hazards or a menace to health, as well as inert materials, because there is no concentration of material and the valve's live rubber seats avoid friction and wear.

The double-damper valve is part of a Hoffman engineered system, another instance of how Hoffman's ingenuity is helping industry achieve the higher standards of safety and efficiency that mean higher output.

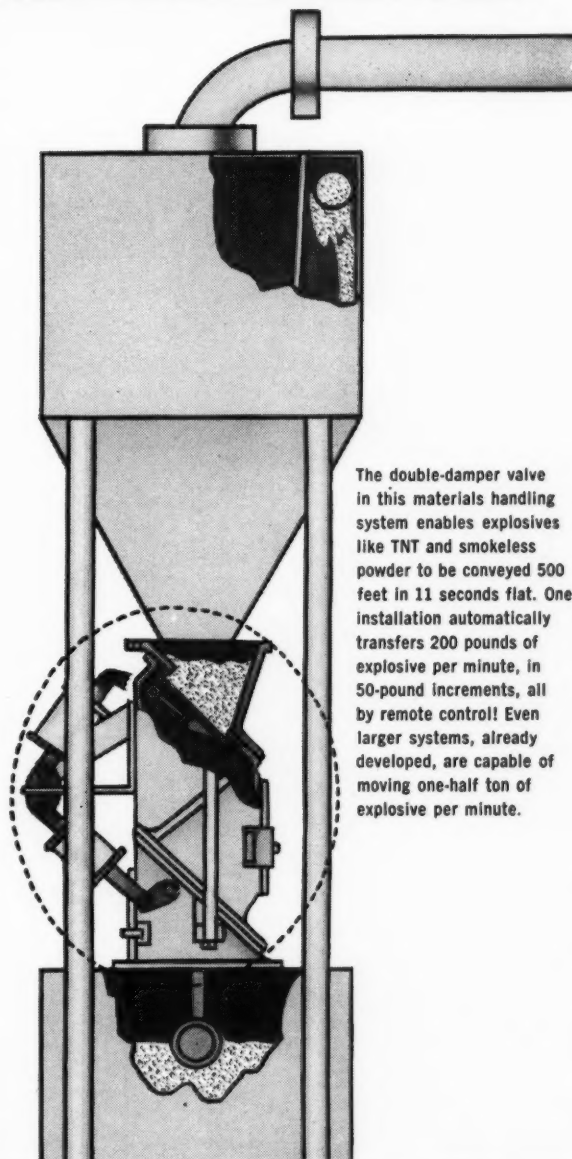
Yes, things are moving in the materials handling field, and Hoffman's engineered systems are moving them! Would a materials conveying system speed up operations . . . avoid danger and wastage . . . increase capacity . . . in plants designed by you?

If you think so, or even if you aren't sure, write or call Hoffman, and learn how our engineers will work with you from design through installation of every system.

U.S. HOFFMAN MACHINERY CORP.

AIR APPLIANCE DIVISION

DEPT. C.E., 103 FOURTH AVENUE, NEW YORK 3, N. Y.



The double-damper valve in this materials handling system enables explosives like TNT and smokeless powder to be conveyed 500 feet in 11 seconds flat. One installation automatically transfers 200 pounds of explosive per minute, in 50-pound increments, all by remote control! Even larger systems, already developed, are capable of moving one-half ton of explosive per minute.

INDUSTRIAL FILTRATION DIVISION

Machine tool coolant clarifiers—
filtration, mechanical and magnetic
Lubricating and insulating oil
conditioners, filters and vaporizers
Solvent recovery systems—
vacuum stills and filters

AIR APPLIANCE DIVISION

Multistage centrifugal blowers
and exhausters
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Industrial vacuum cleaning—
portable and stationary systems
Continuous metal strip driers
"Smoothflow" fittings and tubing

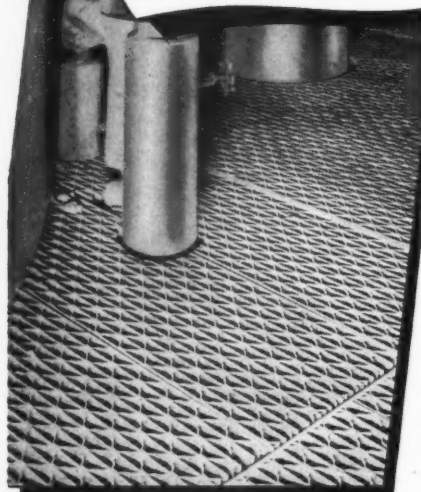
ORDNANCE EQUIPMENT DIVISION

Special pneumatic conveying systems
High-efficiency centrifugal separators
Stationary and portable vacuum-
cleaning equipment
Process equipment
Pneumatic systems for radioactive
materials

BOILER ROOM FLOORS

**MUST
STAY**

**SAFE,
CLEAN**



Ashes, coal and other substances under foot often make solid floors in boiler rooms unsafe.

Such hazardous materials cannot accumulate on a floor made of Irving open steel grating. Debris falls right through, making floors always clean. Dangerous fumes can escape through open grating. Floors made of Irving Grating are clean, safe at all times... no ankle turning, tripping, slipping, hot foots. It is fireproof, self-ventilating.

*Manufacturers of Riveted,
Pressure-Locked,
and Welded Gratings of
Steel, Aluminum and other metals.*

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FOR EVERY PURPOSE"**

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MEN

IN ENGINEERING

Mason G. Lockwood, consulting engineer, of Houston, Texas, has been installed as the new president of the American Society of Civil Engineers. Lockwood is senior partner in the firm of Lockwood, Andrews & Newnam. Francis S. Friel, president of Albright & Friel, Inc., consulting engineers, and Norman R. Moore, chief of the engineering division of the Mississippi River Commission, have been elected vice presidents. Directors elected for three-year terms are Randle B. Alexander, Texas State Highway Department; E. Leland Durkee, Bethlehem Steel Co.; Clinton D. Hanover, Jr., Hardesty & Hanover; William J. Hedley, Wabash R.R. Co.; Finley B. Laverty, Los Angeles County Flood Control District; and Howard F. Peckworth, Concrete Pipe Association.

Charles A. Lawler, partner in the firm of H. E. Bovay, Jr., Consulting Engineers, has been appointed a consulting member of Committee D7 on Wood of the American Society for Testing Materials. The Bovay firm has done extensive planning and design engineering for lumber manufacturing, wood treating, and wood fiber utilization industries.

James M. Montgomery has moved to new offices at 535 East Walnut St., Pasadena, Calif.

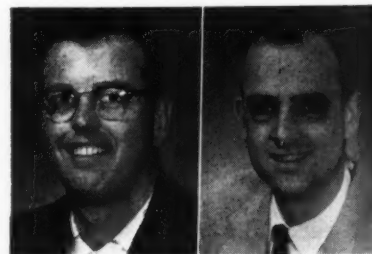
Harry Meserole, president of Balinger-Meserole Co., distributive warehouse consultants of Philadelphia, spoke before the Montreal chapter of the American Materials Handling Society on, "The Growing Science of Warehouse Design," at the September meeting.

United Engineering Trustees, Inc., custodian of the Engineering Foundation's funds, has received a bequest of \$425,000 from the estate of the late Edwin H. McHenry, civil engineer and railroad executive. Net income from the estate will be used by the Foundation to further engineering research projects. After 30

years the principal of the fund may also be used by the Foundation.

Opening of a new district engineering office at Louisville, Ky. has been announced by The Asphalt Institute. Ellis G. Williams, formerly research engineer on bituminous paving with the Kentucky Department of Highways, will be in charge of the new office.

The Asphalt Institute has assigned Fred N. Finn as research engineer on the \$14 million Test Road Project in Illinois sponsored by the American Association of State Highway Officials. The four-year test will employ test loops of asphalt pavement and cement concrete.



KILBY

LJUNGKULL

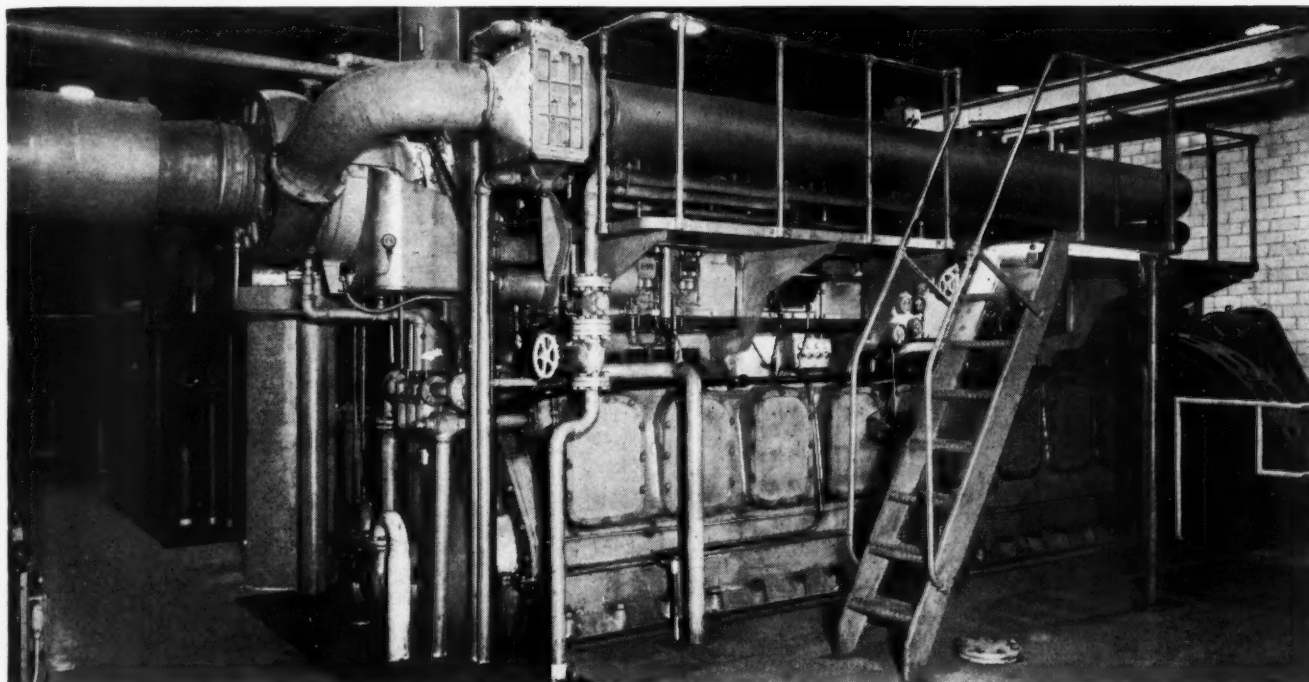
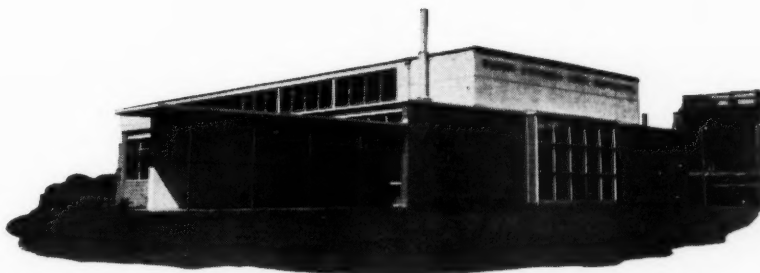
Haarstick Lundgren and Associates, Inc., St. Paul, Minn., have named Howard Kilby and Lars G. Ljungkull as associates of the firm. Both are members of the Minnesota Association of Consulting Engineers.

Newly-elected president of the Cornell Society of Engineers, an alumni association of the College of Engineering at Cornell, is Walter L. Hardy, of Foster D. Snell, Inc. Vice president is Daniel M. Lazar, of Cayuga Construction Co.; secretary-treasurer is Roscoe Fuller, of Heald Machine Co.; and recording secretary is Elliot R. Thompson, of Baldwin-Hill Co.

Hazelet & Erdel, Consulting Engineers, have admitted to the partnership Lewis G. Hexem, Robert H.

The Agra Lite Cooperative near Benson, Minnesota houses five turbocharged Cooper-Bessemer Diesels, each rated 1850 hp at 327 rpm.

This view of Cooper-Bessemer Diesels at Benson shows after-coolers and exhaust-driven turbochargers. All five engines successfully use a No. 6 residual fuel oil.



How an "OIL CHANGE" saved \$30,000 ... in fueling Cooper-Bessemers

The ability of Cooper-Bessemer Diesels to run smoothly and effectively on either heavy fuel, light crude, or a combination of both, is but one of many reasons why so many Cooper-Bessemer units are being installed in cost-conscious plants throughout the country.

Here's an example . . . switching five 1850 hp Cooper-Bessemer Diesels from a higher priced lighter engine fuel to No. 6 residual fuel oil, the Agra Lite R.E.A. Cooperative near Benson, Minnesota effected a one year net saving of \$29,769 . . . a remarkable 30% cost reduction.

And important to note is the fact that this "oil change" resulted in *no* increased wear on the smooth-operating turbocharged Cooper-Bessemers. In fact, the cleaning of valves, fuel pumps and

nozzles periodically has shown these parts to be just as efficient, just as clean as when much lighter fuel was used.

Next time, why not check with Cooper-Bessemer for the ideal solution to *your* particular power problems.



New York City • Seattle, Wash. • Bradford, Pa. • Chicago, Ill.
Houston, Dallas, Greggton, Pampa and Odessa, Texas
Washington, D. C. • Shreveport, La. • San Francisco, Los
Angeles, Calif. • St. Louis, Mo. • Gloucester, Mass. • New
Orleans, La. • Tulsa, Okla. • Cooper-Bessemer of Canada Ltd.,
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DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS

Batch or continuous

**UNITIZED
WEIGHING**

easily installed...lower in cost

UNI-FORCE PLATFORM

...applies only vertical force components... assures full accuracy despite load placement or pile-up. No springs, knife edges or levers. Immune to side thrust.



WEIGHT TRANSDUCER

W-C Electrical Transducer can offer the broadest net weight output range... correspondingly higher accuracy.

W-C Pneumatic Transducer gives force-balance dependability... with independent tare adjustment. Unaffected by vibration. High sensitivity. Accuracy to 0.25% of range.

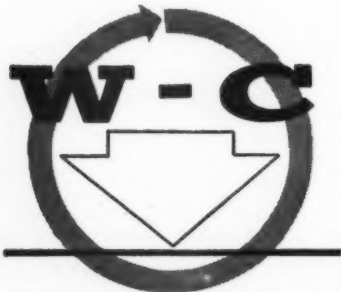


INSTRUMENTATION

Remote indication or fully automatic control of batch or continuous weighing... any material... any vessel or conveyor.



Write for descriptive literature.



WEIGHING and Control COMPONENTS, Inc.

206-F Lincoln Avenue, Hatboro, Pa.

Wood, John H. Clark, III, F. Spencer Weber, and Frederick A. Reickert.

Charles W. E. Clarke has opened an office as engineering consultant in the Main Line Professional Building, Narberth, Pa. Clarke was vice president and director of United Engineers & Constructors, Inc. until his retirement in June of this year, and is now on the Board of Directors.

Westcott and Mapes announces that Theodore Maynz has joined the engineering staff as head of the electrical engineering division.

Holmes & Narver, Inc., Los Angeles, has appointed T. D. Ellison to the position of controller.

Dr. Charles F. Kettering has received the first medal which bears his name for "creative accomplishments for the benefit of mankind, including discovery, invention, improvement in designs or processes within the relationship of materials and energy." The medal, awarded by the four founder Societies, AICHE, and SAE, will be awarded annually to an outstanding engineer.

Peter B. Gordon, vice president of Wolff and Munier, Inc., of New York, has been nominated for the presidency of the American Society of Heating and Air-Conditioning Engineers. Nominee for first vice president is Elmer R. Queer, director and professor of engineering research, Pennsylvania State University; second vice president, Arthur J. Hess, president of Hess-Greiner & Polland, Los Angeles; for treasurer, Charles H. Pesterfield, professor of mechanical engineering, Michigan State U.

The office of Robert S. Loomis has moved to new quarters in the Windsor Federal Savings & Loan Building, Windsor, Conn.

The American Road Builders' Association has established a committee on photogrammetry to keep members abreast of new developments in the field. Chairman is William C. Cude, chief of the Topographic Engineering Department, Army Engineer Research and Development Laboratories, and national president of the American Society of Photogrammetry. Serving as members of the committee are: Walter X. Brennan, Abrams Aerial Survey Corp.; Lester C. Andrews, Michigan Department of Aeronautics; William O. Baker, Michael Baker, Jr., Inc.; John H. Barr, County Road Association of Michigan; E. A. Bellenbaum, Michigan State Highway Department; Ford Bartlett, Lockwood, Kessler and Bartlett; Thomas L. Bransford, State Road Department of Florida; I. W. Brown, Mississippi State Highway Department; R. M. Brown, State Highway Department of Indiana; K. S. Curtis, Purdue University; George D.

Hardy, Abrams Aerial Survey Corp.; Sumner B. Irish, Princeton University; Donald R. Lueder, The Photographic Survey Corp., Ltd.; Leo V. Nothstine, Michigan State College; William F. Pafford, Pafford, Jones & White; C. E. Palmer, American Society of Photogrammetry; C. M. Spainhour, Airways Engineering Corp.; and Lewis A. Woodward, Jack Ammann Photogrammetric Engineers, Inc.

Frank W. Edwards, manager of the Chicago office of Stanley Engineering Co., has become an associate in the firm.



EDWARDS

GRILLI

John P. Grilli has been appointed special representative on metallurgical projects by H. K. Ferguson Co.

Raymond R. Wisner, of Stone and Webster Corp., Boston, Mass., has been named a Fellow of the American Institute of Electrical Engineers for "his application of electrical engineering to the design of power plants and the problems of industry."

The Steel Division of Arthur G. McKee & Company has moved into the new engineering building at Euclid Ave., near E. 24th St., Cleveland. The \$500,000 building was completed in September.

Plumb, Tuckett and Pikarsky, Gary, Ind., have opened a branch office in the Kimball Building, 25 E. Jackson Blvd., Chicago. Milton Pikarsky, Partner, is in charge of the new office. Architect at the office is Ernest R. Seymour who joined the firm this July. New additions to the staff are Douglas M. Ward, Robert C. Book, and Robert D. Reeise, draftsmen; and Benjamin Hernandez and Hilary J. Nakielski, designers. Design work on the Illinois Toll Road will be transferred to the Chicago office.

The Committee on Masonry and Reinforced Steel Concrete of the Structural Div. of the American Society of Civil Engineers has appointed four committees to report on recommended practice in: limit design; precast structural design and construction; interaction of concrete on steel, timber, and precast concrete supporting members and reinforced masonry design and construction. Jack R. Janey, Chicago

Top structural strength

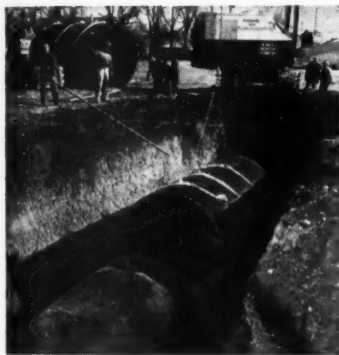
Top material durability

Top flow capacity

Only with an Armco Sewer can you get all 3

Armco Corrugated Metal Sewers offer advantages unmatched by any other type of sewer structure. Want proof? Check the following four statements. Only an Armco

Sewer gives you the choice of all these advantages in a single structure. And you can specify the strength and durability **required** by your application.



- ☐ Flexible corrugated metal strength to withstand the impact of live loads without cracking or breaking.
- ☐ Choice of coatings to meet corrosive conditions, plus a thick pavement to combat erosion if required.
- ☐ A smooth interior to provide utmost flow capacity when desirable.
- ☐ Strong, quickly-applied joints that eliminate possibility of disjointing, infiltration or failure as an integral conduit.

Strength?

Armco Structures are used under fills as high as 165 feet. One, under a railroad in Wyoming, still has perfect alignment after 29 years under a 77-foot fill.

Material Durability?

49-year-old Armco Sewers are still giving good service today. And these have just a plain galvanized coating. Today's Armco ASBESTOS-BONDED Structures will assure a much longer life.

Top flow Capacity?

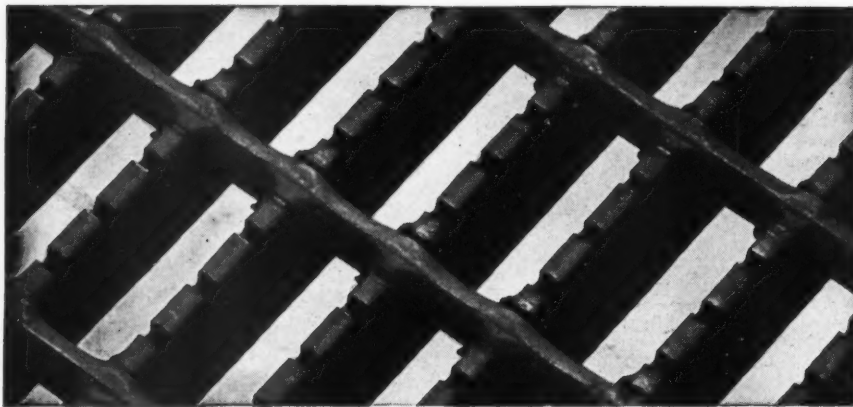
Armco's new sewer product, SMOOTH-FLO Pipe, has a smooth spun asphalt lining covering all inside corrugations. There is nothing to impede flow, even on flat slopes.

For data, just write us and tell about your sewer problem. We'll also give you recommendations, if you wish. Armco Drainage & Metal Products, Inc., 4046 Curtis Street,

Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.



Armco Sewer Structures



Gary

**New Slip-Proof Design makes
SERRATED GRATING safest
WHERE GOOD TRACTION IS IMPORTANT**



FREE SAMPLE

We'll send this handy paper weight if you request it on your company stationery.

Indoors or out, for area gratings in sidewalks, inclined walkways, fire escapes—wherever safe-footing is important, this one-piece, resistance-welded grating will provide safer working conditions. It's tailor-made to your requirements. Write for descriptive Catalog CE-116

Standard Steel Spring Division
ROCKWELL SPRING AND AXLE CO.
4015 East Seventh Avenue • Gary, Indiana



at no extra cost

with

STUD WELDING

... the fastest electric arc welding process for end welding fasteners



KSM PRODUCTS, INC.
stud welding division
MERCHANTVILLE 28, N. J.

consulting engineer, is chairman of the committee on precast structural design recommendations.

LeRoy Crandall & Associates have moved to new and larger quarters at 1619 Beverly Blvd., Los Angeles.

V. E. Shogren, Engineer, has moved his offices to 6913 Market St., Youngstown, Ohio.

James H. Howard & Associates have moved to new and larger quarters at 2728 Wesleyan St., Houston, Texas. Other offices are located in Lake Charles, La., and Clarkdale, Ariz.

New headquarters of the Society of Automotive Engineers is at 485 Lexington Ave., New York City.

The firm of Thayer and Lewis, Consulting Engineers, has changed its name to Thayer-Lewis-Meakin and Associates, Architects and Engineers. Clarence W. Meakin, architect, is a partner in the new firm.

George R. Halton, expert in soil mechanics, is the new head of the Highway and Airport Division of The Kuljian Corp.

Fred S. Dubin Associates, Inc. has opened new offices at 136 Boylston St., Boston, Mass.

The engineering firm of Dan. E. Sewell and Associates has announced that Brigadier General Paschal N. Strong (U.S. Army Ret.) has joined the firm as Consulting Engineer.

The Kuljian Corp. celebrated its 25th anniversary in October with a dinner at the Barclay Hotel in Philadelphia. David Maxwell, president of the American Bar Association, presided as toastmaster. Speakers included Harry A. Kuljian, president; James L. Cherry, executive vice-president; Arthur H. Kuljian, vice president, engineering; Dr. James Creese, president of Drexel Institute of Technology; and Col. John Vassos, design consultant of Radio Corporation of America.

Frank Eastman, registered engineer and land surveyor, has joined the staff of Lenon Engineering Offices, Patagonia, Ariz., as field engineer.

Kaiser Engineers Division of Henry J. Kaiser Co. has appointed David H. Wheeler as Air Pollution Control Engineer, with headquarters in Oakland, Calif. He will act as consultant on air pollution control problems and applications with general industry, as well as in the construction of new plants and facilities throughout the U. S.

W. H. Harper has joined the firm of Fischer & Associates, Inc., Cleveland, Ohio.

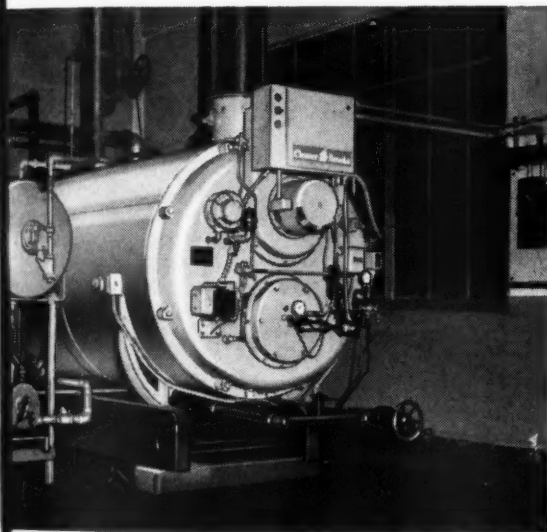
CONSULTING ENGINEER

One of America's largest and leading
dairy associations uses

69 CLEAVER-BROOKS BOILERS

Special note to dairymen:
See Cleaver-Brooks boiler exhibit
at the Dairy Show,
ATLANTIC CITY
Oct. 29 — Nov. 3.
Booth W.50

Location of Cleaver-Brooks
boilers in League plants.
Dairymen's League facilities
include 70 country plants, 24 city
branches, 6 ice cream plants
and 9 manufacturing plants



MILTON, PA. — This country plant is supplied
with quick, dry steam from a Cleaver-Brooks
40 hp light-oil fired CB boiler.



"Our 69 Cleaver-Brooks boilers are a key
part of our production — their unusually
high efficiency, sanitary, clean operation
have helped us grow and prosper", says Ken
Dodge, staff engineer for Dairymen's League
Cooperative Association.

"Maintenance is low. We average far less than one service call
per boiler per year," he adds.

Dairymen's League Cooperative Association, serving 25,000
dairy farmers and thousands of consumers in New York, Pennsylv-
ania and New Jersey, has been a steady user of Cleaver-Brooks
boilers for 20 years.

Like any dairy company, the League finds steam essential for
the production of quality dairy products. Their boilers are the work
horses of their plants — supplying steam for pasteurizing, heating,
cleaning and processing.

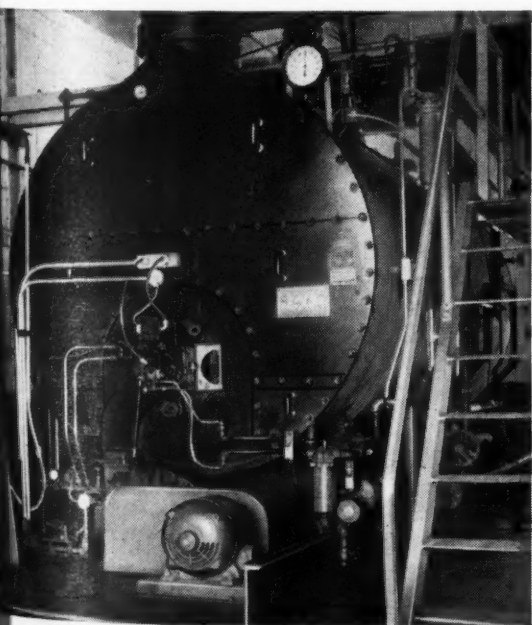
And Cleaver-Brooks boilers, with their exclusive four-pass,
forced draft design and clean, quiet operation are especially suited
to dairy plant operation.

Famous dairies the country over are profiting with the many
advantages of Cleaver-Brooks boilers, available in a complete line.
You can select from 110 models in 18 boiler sizes, 15 through 600 hp
... oil, gas and combination oil and gas fired.

For more information contact your nearby Cleaver-Brooks
representative. Or write Cleaver-Brooks Company, Dept. M, 321 E.
Keefe Avenue, Milwaukee 12, Wis. Cable Address: CLEBRO —
Milwaukee — all codes.

Cleaver  Brooks

ORIGINATORS OF THE SELF-CONTAINED BOILER



UTICA, N.Y. — In this city plant a 250 hp LR
heavy-oil fired boiler provides all steam for
pasteurizing, cleaning, heating and processing.

New Projects Reported

By Consulting Engineers—

ARKANSAS

H. Price Roark, Structural Eng., Edgar K. Riddick, Jr., Mechanical Eng., Erhart, Eichenbaum & Rauch, Architects. Forrest Memorial Hospital, Forrest City, Ark. \$750,000. Client, Hospital Board.

Motel Sam Peck. Little Rock, Ark. \$300,000. Client, Mr. Sam Peck.

ARIZONA

Johannessen & Girard, Phoenix-Tucson, Ariz. Runway extension project, Luke Air Force Base, Ariz. Project will include: 3500 ft extension of southwest end of northernmost of parallel NE-SW runways; associated taxiways, pads, and aprons; additional lighting as required; 3500 ft culvert for drainage. \$2,000,000 (est.). Client, Corps of Engineers, U.S. Army (Los Angeles Dist.).

CALIFORNIA

John A. Blume, San Francisco, Calif. Oil well drilling island, off shore of Rincon, Calif., consisting of outer ring of breakwater rock with land-filled center. Over-all area, 3 acres. Client, Richfield Oil Corp., Los Angeles, Calif.

Kenward S. Oliphant, San Francisco, Calif. 16-story office building with the main office of American Trust Co. between California and Sacramento Sts. and Montgomery and Leidesdroff Sts., San Francisco. \$8,000,000. Client, Myer & Evers, Architects, San Francisco.

One-story Gazzera Professional Offices, El Camino Real, Mountain View, Calif., with additional rental units. \$75,000. Client, J. T. Miller, Architect, Mt. View.

E. J. Kelly & Associates, Inc., Los Angeles, Calif. Doubling capacity of pineapple juice concentration and essence recovery installation. Includes low temperature evaporators, refrigeration, pumps, and tanks. \$500,000. Client, Hawaiian Pineapple Co., Ltd., Honolulu.

Porter, Urquhart, McCreary & O'Brien, San Francisco, Calif. Design of runway system for nuclear powered aircraft, at National Reactor Testing Station, Idaho. \$15,000,000. Client, Atomic Energy Commission.

Design of runway system and support items, at Beale Air Force Base, Calif. \$16,000,000. Client, Strategic Air Command, U.S.A.F.

B. C. Allin. Erection of water tank and water main changes. \$55,000. Sprinkler system on wharves. \$35,000. Client, Board of Commissioners, Port of Redwood City, Calif.

Alfred J. Ryan & Associates. Parking garage, Oakland, Calif. \$850,000. Client, The Capital Co., San Francisco, Calif.

Smith, Hinchman & Grylls, and Hosman & Hastings. Auto assembly plant, all welded construction, Rivera, Calif. Client, Ford Motor Co., Mercury Div.

COLORADO

Smith & Tao, St. Louis, Mo. Office & warehouse, Metal Goods, Inc. Denver, Colo. \$200,000. Client, Syl G. Schmidt.

CONNECTICUT

John P. Legnos, Hartford, Conn. Intensive treatment building, Middletown, Conn., State Hospital. Radiant heating, air conditioning, ventilating. \$5,000,000. Client, Walter Crabtree, Architect.

Bristol High School, Bristol, Conn. Heating, plumbing, electrical. \$3,500,000. Client, Harold Haypen, Architect.

Hartford Regional Technical High School, Hartford, Conn. Heating, plumbing, electrical. \$4,500,000. Client, Russell Hills, Architect.

Robert S. Loomis, Windsor, Conn. Cornerstone Club building, West Hartford, Conn. \$300,000 (est.). Client, Kane & Fairchild, Architects, Hartford.

Warehouse, Hartford, Conn. \$30,000 (est.). Client, General House Wrecking Co., Hartford.

Goodkind & O'Dea, Bloomfield, N. J. Route 9 relocation, in towns of Simsbury, East Branby, and Bloomfield, Conn. Length of project 4 miles including major structure over the Farmington River. \$2,700,000. Client, Connecticut State Highway Dept.

William G. Christy, New York City. Air pollution survey and drafting of air pollution ordinance. Client, City of Bridgeport, Conn.

Fred S. Dubin Associates. Research Laboratory and Pilot Plant, Div. of National Research Co., Stamford, Conn. Plumbing, heating, electrical, air conditioning, waste disposal, and laboratory services. \$2 million (est.) Client, Escambia Bay Corp.

Darian, Connecticut Library, plumbing, heating, electrical. \$200,000. Client, architect, Arthur Gillkinson.

FLORIDA

Briley, Wild & Associates, Consulting Engineers, Daytona Beach, Fla. Water supply treatment plant, and distribution system. \$285,000. Client, City of Edgewater, Fla.

Enlargement of sewage treatment plant, new sewage treatment plant for beach, water system improvements, storm sewers, misc. improvements. \$2,210,000. Client, City of Clearwater, Fla.

Briley, Wild & Associates, Consulting Engineers, Daytona Beach, Fla. and **Black and Associates, Engineers,** Gainesville, Fla. Extension of water transmission mains and distribution lines including booster stations, etc. \$700,000. Client, Board of County Commissioners, Pinellas County, Fla.

E. J. Kelly & Associates, Inc., Los Angeles, Calif. Expansion of citrus juice freezing facilities by modification of freezing tunnel, additional refrigeration compressors and votators. \$80,000. Client, Haines City, Fla.

GEORGIA

Jack K. Wilborn, Atlanta, Ga. Office and showrooms, Austell, Ga. \$100,000. Client, Fuller & Beckett, Architects.

Education building for Tabernacle Baptist Church, Carrollton, Ga. \$200,000. Client, Barker & Cunningham, Architects.

T. Dennis Hays, Macon, Ga. Air conditioning system, existing Municipal Auditorium, Macon, Ga. Chilled water system using existing duct system for approximately 35 percent of the load, fan coil units in occupied areas for balance. Total capacity 300 tons. Rewiring of electrical system included. **R. Berl Elder, Electrical Engineer,** and **T. Z. Chastain, Structural Engineer,** associates on project. \$120,000. Client, City of Macon, Ga., City Council.

Building expansion program, two building additions for dormitory space, 1 new Student Activity building, 100 tons of air conditioning, plumbing, and heating systems. \$135,000. Client, W. Elliott Dunwoody, Jr., Architect, Macon, Ga.

ILLINOIS

Suter & Sommerschild, Chicago, Ill. Addition and alterations to ticketing and operations facility at Midway Airport, Chicago, Ill. \$100,000. Client, Braniff International Airways.

Four 3-span bridges over ravine. Bridge decks to be precast prestressed members supported on hammerhead piers. \$320,000. Client, City of Highland Park, Ill.

Smith & Tao, St. Louis, Mo. Swimming pool, Alton, Ill. \$125,000. Client, Erwin C. Schmidt, Architect.

Immanuel E & R Church, Hamlet, Ill. \$120,000. Client, Erwin C. Schmidt, Architect.

Robert H. Anderson, St. Charles, Ill. Water supply improvements. New well, pumps, treatment facilities, etc. In conjunction with **W. A. Rakow & Asso-**

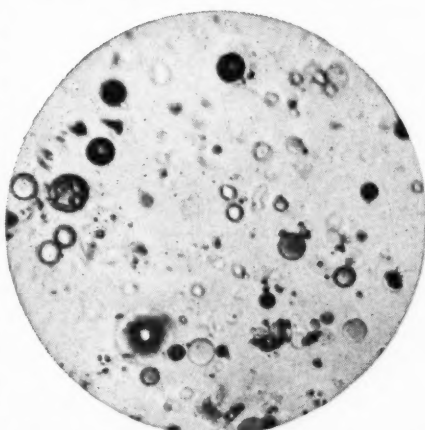
Why a Cement-and-Fly Ash Mix Makes a Superior Concrete

Eight Ways Better than Straight Cement Concrete Yet Usually Costs Less in Place

In modern practice the "straight cement" mix is rapidly giving way to mixes employing cement with various proportions of high grade Fly Ash. These produce a concrete of superior qualities, due to the Pozzolanic action of the Fly Ash, a finely divided mixture of silicates and aluminates shown here. Its spherical, glassy particles react with the extra lime always released in hydration of cement, forming *additional* cementing compounds.

A "Must" in Prepak[®] Method

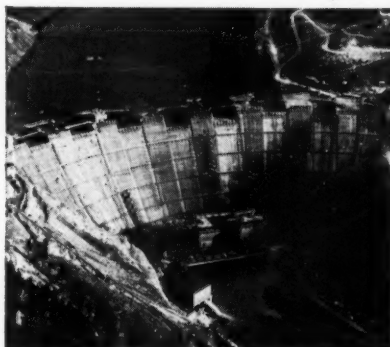
Selected Fly Ash, meeting rigid specifications, is essential to Intrusion concrete methods. It permits better mortar flow under pressure with a minimum of water.



"Ball bearing" shape and extreme fineness of Fly Ash particles make concrete more workable. Photo shows them magnified about 400 times.



Mackinac Bridge; Fly Ash in Prepak[®] Concrete



Hungry Horse Dam; Fly Ash in Mass Concrete

Construction Jobs in Wide Variety Show the Improved Results of Using Cement-Fly Ash Concrete Mixes

Fly Ash has proved its ability to improve the concrete in every type of construction—in huge dams, subway and sewer projects, bridges, skyscraper foundations and superstructures, pavements and other building, large and small. Architects and engineers from coast to coast are enthusiastic in their praise from actual experience with Fly Ash.

The Facts Are Well Established—Send for Full Information

FLY ASH Improves

Compressive Strength
Workability, Finish
Appearance

Increases Resistance to

Penetration by Water
Sulfuric Acid, Sulfates

Reduces

Cost of Concreting
Heat of Hydration
Harm from Freezing
Harmful Expansion

That Fly Ash improves concrete, reduces the bad effects of water penetration, of sulfates, of heat of hydration, freezing, expansion—all without loss of 28-day strength—is amply proved by many independent engineering tests. The results are available; why not send for them? It costs nothing to get the facts

on Fly Ash; it might mean a great deal in the success of your practice. Each of the following companies has staff engineers to assist in writing specifications for particular projects and to furnish technical help and data on the use of their Fly Ash of proven performance.

Your letter or call will be welcomed.

ATLAS FLY ASH, INC.

2450 William St., Buffalo 6, N. Y.

DETROIT EDISON COMPANY

2000 Second Ave., Detroit 26, Mich.

CHICAGO FLY ASH COMPANY

228 N. La Salle St., Chicago 1, Ill.

G. & W. H. CORSON, INC.

Plymouth Meeting, Pennsylvania

1. Compressive Strength

Many independent tests of concrete made with a percentage of Fly Ash show equal or greater 28-day strengths than shown by samples of straight cement concrete.

2. Workability

Due to the spherical particles of Fly Ash (see micro-view, left) plastic concrete made with it flows better, is more easily placed.

3. Finish, Appearance

A part Fly Ash mix fills forms better, results in smooth surfaces, sharp edges, fewer voids and much less efflorescence.

4. Less Penetration

Engineering tests under controlled conditions show definitely less penetration by water than for straight cement concrete.

5. Resists Sulfates

Subjection of test samples to action of sulfates and sulfuric acid shows markedly better resistance by cement-Fly Ash concrete.

6. Less Heat of Hydration

Controlled tests on concrete in place have shown 60° rise in temperature for Fly Ash concrete, 84° for that of straight cement.

7. Less Harm from Freezing

Tests of samples of air-entrained concrete made with and without Fly Ash show much less drop in elasticity, during 500 cycles of freezing and thawing, for the Fly Ash lots.

8. Less Expansion

Tests of samples made with known reactive sand show much less expansion, due to cement-aggregate reaction, where Fly Ash is used in the mix.

**And Usually, All the Above
at a Saving in Cost!**

CONFIDENTIAL

PLANT LOCATION FACTS

Where to find plenty of the right kind of WATER

New York State has water in great quantity and of the right quality for industrial operations.

We can provide the answers to all your questions on water supply at any New York State location and without cost to you. We have complete details on all the municipal water supplies in New York State. We can provide measurements of the quantity or rate of flow of most of the State's important surface waterways based on records kept for periods up to nearly half a century. In the case of ground water supplies, we can provide data concerning the probable yield and fluctuations in the water table at any New York State locality.

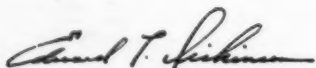
The character or quality of New York State's water, both surface and underground, has also been determined. Analyses are available which show the content of various mineral and other materials, hardness, pH range, temperature and many other factors. The water available for use at any given location can be specially sampled and analyzed for you.

Water won't be your only problem in deciding on a new plant location. You will want complete facts on labor, markets, available sites or buildings, power, fuel, transportation and raw materials to mention just a few. And you will want information on these as they apply to the successful operation of a specific plant.

A tailor-made report

Any or all of the factors important to your analysis will be covered in a confidential report to you—tailored to your needs. It will be prepared by a professional and experienced staff to cover either New York State locations of your choice, or, if you wish, sites which we will select on the basis of your needs.

Our booklet, "Industrial Location Services," explains what we can do for you. To get your free copy, write me at the New York State Department of Commerce, Room 581, 112 State Street, Albany 7, New York.



EDWARD T. DICKINSON
COMMISSIONER OF COMMERCE

ciates, Consulting Municipal Engineers, Engineer for the Village of West Dundee. \$100,000. Client, Village of West Dundee, Ill.

Bradley & Bradley, Rockford, Ill. New Junior High School for 900 students, Sheboygan, Wis. \$1,500,000. Client, Public Schools, City of Sheboygan.

New intermediate school. \$2,350,000. Client, Rockford Public Schools.

New Ashton High School. \$600,000. Client, School Dist. 275, Ashton, Ill.

Beling Engineering Consultants, Methodist Church, Bradley, Ill. Client, Kruegel, Wilkins.

Heller Residence, Peoria, Ill. Client, Phillips & Swager.

Bradley University Student Center, Peoria. Client, Lankton-Ziegele-Terry.

Hazel Crest Grade School addition, Cook County, Client, Kruegel, Wilkins.

Mt. Hawley Country Club addition, Peoria. Client, Lankton-Ziegele-Terry.

IOWA

Clark Engineering Co., Des Moines, Iowa. Alternate to Iowa State Highway Commission standard design for precast concrete bridges—18, 24, and 30 ft spans for 20 ft 9 in. and 24 ft 0 in. roadways, H-15 loading. Client, The Pioneer Lumber Co., Des Moines, Iowa.

Smith & Tao, St. Louis, Mo. Holy Trinity Church, Des Moines, Iowa. \$335,000. Client, Marc Gruenenfelder, Architect.

Pius X School, Des Moines, Iowa. \$175,000. Client, Marc Gruenenfelder, Arch.

KANSAS

Smith & Tao, St. Louis, Mo. Dial building, Topeka, Kans. \$250,000. Client, S. W. Bell Telephone Co.

Dial building addition, Wichita, Kans. \$300,000. Client, S. W. Bell Telephone Co.

LOUISIANA

Demopoulos & Ferguson, Shreveport, La. Water treatment plant (\$1,000,000), water distribution improvements (\$2,000,000), drainage improvements (\$350,000). Client, Bossier City, La.

F. H. McGraw & Co., New York City. Alumina plant at Burnside, La. Complete processing facility on 4100-acre plot, on Mississippi River. \$50 million. Client, Olin Revere Metals Corp.

MARYLAND

Henry Hagel, Addition to grain elevator and silo, three bins and manlift, 91 ft high. Client, Sherwood Feed Co., Baltimore, Md.

Conveyor for clay moulding, including elevators and belt conveyors. Client, Insulator Dept., General Electric Co., Baltimore, Md.

Institutional building, Bethesda, Md.

Concrete frame structure and solid brick walls. \$2,500,000. Client, Owner.

Herbert Manuccia, P. E. & Associates, Elementary School Addition, Damascus, Md. \$110,000. Client, F. Duane, Arch.

MASSACHUSETTS

Robert S. Loomis, Windsor, Conn. St. Mary's parish school, Lee, Mass. \$300,000 (est.). Client, Morris W. Maloney, Architect, Springfield, Mass.

Brask Engineering Co., Boston, Mass. Reconstruction of Memorial Drive and Cambridge Parkway at Longfellow Bridge, Cambridge, Mass. \$2,500,000. Client, Commonwealth of Massachusetts, Metropolitan District Commission.

Automation Management, Inc. Automation of powder metal parts press. Worcester, Mass. \$3000. Client, Presmet Corporation.

Henry Hagel, Building, Chalesgate and Ipswich Sts., Boston, Mass. 26,000 sq ft, three-story concrete frame on piles. Sidney Kalin, Architect. Client, Elpanco, Inc., Baltimore, Md.

MICHIGAN

Wesley Bintz, Lansing, Mich. South Haven, Mich., Sleepy Hollow Resort. Steel swimming pool 35 x 75 ft, with filter plant and inter-connecting piping. Walks around pool, wading pool, fence, bathhouse for bathers, filter plant, and other details. \$45,000. Client, Edward Gray, manager and owner, Sleepy Hollow Resort.

Emmerling-Calkins, Inc., Detroit, Mich. School for Girls on Beck Road, Northville Township. **Hyde & Bobbio, Inc.,** mechanical and electrical engineers. First unit, \$800,000. Client, Sisters of St. Mary of Providence.

Two Lutheran High Schools, West Side, Greenfield near Tireman, Detroit, Mich. East Side, Kelly Road near Eight Mile Rd., Harper Woods, Mich. **Hyde & Bobbio, Inc.,** mechanical and electrical engineers. \$800,000 (each). Client, Detroit Lutheran High School Assoc.

Primary power distribution for Scott Paper Co. plant, Detroit, Mich. **King & Park, Inc.,** mechanical and electrical engineers. \$100,000 plus. Client, Scott Paper Co.

Ken Fishbeck, Lansing, Mich. Storm and sanitary sewer outlets for married student housing. \$165,000. Client, Michigan State Univ., East Lansing.

Extensions to sanitary sewer system, 10,600 lin ft of 8 in. vitrified pipe and appurtenances. \$48,000. Client, Fowler, Mich.

Storm and sanitary sewer systems including two pumping stations. \$480,000. Client, City of Charlotte, Mich.

Robert A. Willihnganz, Detroit, Mich. Formulation of colored asphalt emulsions. \$10,000. Client, Amchem Corp.

CONSULTING ENGINEER



PVC Diaphragm Valves by Hills-McCanna

The proven partner for PVC Piping

For the finest valving in plastic piping systems—specify the valve with experience “built-in”—The Hills-McCanna Diaphragm Valve made of PVC.

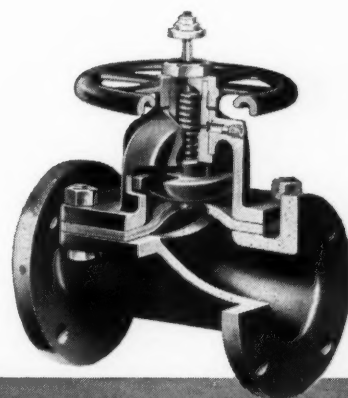
ONLY Hills-McCanna Plastic Valves offer all these features—

- Complete chemical resistance of unmodified PVC.
- Rugged body construction with heavy wall sections and embedded reinforcing members.
- Positive valve closure with exclusive sealing bead diaphragm.
- Simple, cost-saving in-line maintenance.
- 25 years of diaphragm valve manufacturing and application experience.
- More than 10 years of research and manufacturing experience on plastic valves alone.

PVC is just one of several plastic body materials offered by Hills-McCanna. Also available are bodies of polyethylene, Saran and Uscolite. Diaphragm materials include rubber, neoprene, Hycar, Tygon, Compar, polyethylene, Kel-F and Teflon. Size range from ½" through 2". Sold and serviced by Hills-McCanna representatives coast to coast and by leading distributors of plastic pipe. For further information request Catalog No. 100.

HILLS-McCANNa CO.

2446 W. Nelson St., Chicago 18, Ill.



HILLS-McCANNa

Corrosion Specialists Since 1870

MANUFACTURERS OF: DIAPHRAGM VALVES • CHEMICAL METERING AND PROPORTIONING PUMPS • FORCE FEED LUBRICATORS • LIGHT ALLOY CASTINGS

NOVEMBER 1956

**More Accurate
Level Reading
of LOW
TEMPERATURE
LIQUIDS...
JERGUSON
Large Chamber
NON-FROSTING*
GAGES**

You get the highest possible accuracy of reading on low temperature, low boiling point liquids with the patented Jerguson Non-Frosting Gage in the New Large Chamber model . . . because it insures less turbulence at the meniscus, and clear vision at the vision slot.

This new Jerguson model has 6 times larger area at the meniscus than the standard gage, so that there is a marked reduction in turbulence with light gaseous fluids that tend to boil or surge. Moreover, the problem of frosting encountered with these liquids has been eliminated by a patented frost preventing unit extending from the gage glass. This special transparent unit projects beyond the cover bolts and prevents frost from building up over the vision slot.

Here's a dual feature gage that assures greatly increased accuracy of reading for the process industries. If you have a problem with light gaseous fluids, or with gage frosting, it will pay you to investigate the new Jerguson Large Chamber Non-Frosting Gage . . . reflex or transparent.



Jerguson Large Chamber Gage, Transparent Type, with the patented Non-Frosting Gage Glass Extension. Write for literature on this gage, and on other non-frosting Jerguson models.

**Patented*

JERGUSON

*Gages and Valves for the
Observation of Liquids and Levels*

JERGUSON GAGE & VALVE COMPANY
100 Fellsway, Somerville 45, Mass.

Offices in Major Cities

Jerguson Tress Gage & Valve Co., Ltd., London, Eng.
Pétrole Service, Paris, France

Steven Antonoff & Associates, Detroit, Mich. Bridge carrying M-22 over Platte River in Benzie County. \$75,000. Client, Mich. State Hwy. Dept.

Grade separation on relocation of US-23 and US-12 north of Ann Arbor. \$265,000. Client, Mich. State Hwy. Dept.

Grade separation on relocation of US-23 at N. Territorial Road. \$120,000. Client, Mich. State Hwy. Dept.

Grade separation on relocation of US-23 at Ann Arbor R. R. \$300,000. Client, Mich. State Hwy. Dept.

Grade separation on relocation of US-23 at Barker Road. \$180,000. Client, Mich. State Hwy. Dept.

MINNESOTA

Davy Engineering Co., Inc., LaCrosse, Wis. Preston pool and bathhouse, Preston, Minn. \$55,000.

Winona Municipal dock, Winona, Minn. \$60,000.

MISSOURI

Allgeier, Martin & Associates, Joplin, Mo. Sewerage improvement program. \$1,500,000. Client, City of Joplin, Mo.

Water and sewerage improvement program. \$300,000. Client, City of Greenfield, Mo.

Sewer system. \$130,000. Client, City of Liberal, Mo.

Water System. \$90,000. Client, City of Diamond, Mo.

Smith & Tao, St. Louis, Mo. Mary, Queen of the Universe School and Church, St. Louis, Mo. \$275,000. Client, Charles Leisse, Architect.

Hospital addition, St. Anthony's Hospital, St. Louis, Mo. \$100,000. Client, Ralph Ranft, Architect.

St. John's School, Jefferson Co., Mo. \$250,000. Client, Charles Leisse, Arch.

St. Dismas School, St. Louis Co., Mo. \$275,000. Client, Marc Gruenenfelder, Architect.

Fred S. Dubin Associates, Ledue Junior, Senior High School, St. Louis, Mo. Plumbing, heating, electrical, and utilities. \$1½ million. Client, Murphy & Mackey, Architects.

Murphy & Mackey Office Building with offices for Fred S. Dubin Associates, St. Louis, Mo. Plumbing, heating, electrical, air conditioning, and utilities. \$1½ million. Client, Murphy & Mackey, Architects.

NEBRASKA

Miner and Miner, Consulting Engineers, Inc. 32 miles of 69-kv transmission line, 40 miles 12-kv distribution line. \$400,000. Two 3750-kva substations plus miscellaneous substation improvements located near Culbertson and Haigler, Nebr. Client, Southwest Public Power District, Palisade, Nebr.

NEW JERSEY

Frederick C. Lowy, New York City. Building No. 173, Port Newark, N. J., Petri Wine Company bottling plant. \$1,000,000. Client, The Port of New York Authority.

F. H. McGraw & Co., New York City. Equipment moving and alterations to factory, New Brunswick, N. J. \$300,000. Client, Squibb Pharmaceutical Co.

William G. Christy, New York City. Comprehensive air pollution survey of area around new Bergen generating station, Ridgefield, N. J. Client, Public Service Electric & Gas Co., Newark.

Walter Kidde Constructors, Inc. Design and construction of two-story customer service laboratory, Union, N. J. Client, Shell Chemical Corp.

NEW MEXICO

Bridgers & Paxton, Albuquerque, N. M. Church for Our Lady of Fatima parish, Albuquerque, N. M. \$300,000. Client, W. C. Kruger, Architect.

Laboratory building, Holloman Air Force Base, N. M. Client, K. S. Clark.

Junior High School, Clovis, N. M., air conditioned. \$250,000. Client, James A. Burrow, Architect.

Carl R. Albach, Consulting Engineer, Electrical. Mountain States Tel. & Tel. Co. main office addition, Albuquerque, N. M. \$1,141,000. Client, Louis G. Hesselden, Architect.

Eubank Elementary School addition, Albuquerque, N. M. \$198,950. Client, Louis G. Hesselden, Architect.

Gymnasium, University of New Mexico, Albuquerque, N. M. (First 400 cycle lighting installation west of New York.) \$2,000,000. Client, Meem, Zehner, Holien & Associates, Architects.

Crew Readiness Building. \$200,000. Client, Kenneth S. Clark, Architect.

G/M Laboratory Tech. Analysis. \$250,000. Client, Kenneth S. Clark, Architect.

M. A. #15 Building. \$300,000. Client, Kenneth S. Clark, Architect.

Components Laboratory. \$100,000. Client, Kenneth S. Clark, Architect.

Kit Carson School addition, Albuquerque, N. M. \$180,000. Client, R. R. Springman, Architect.

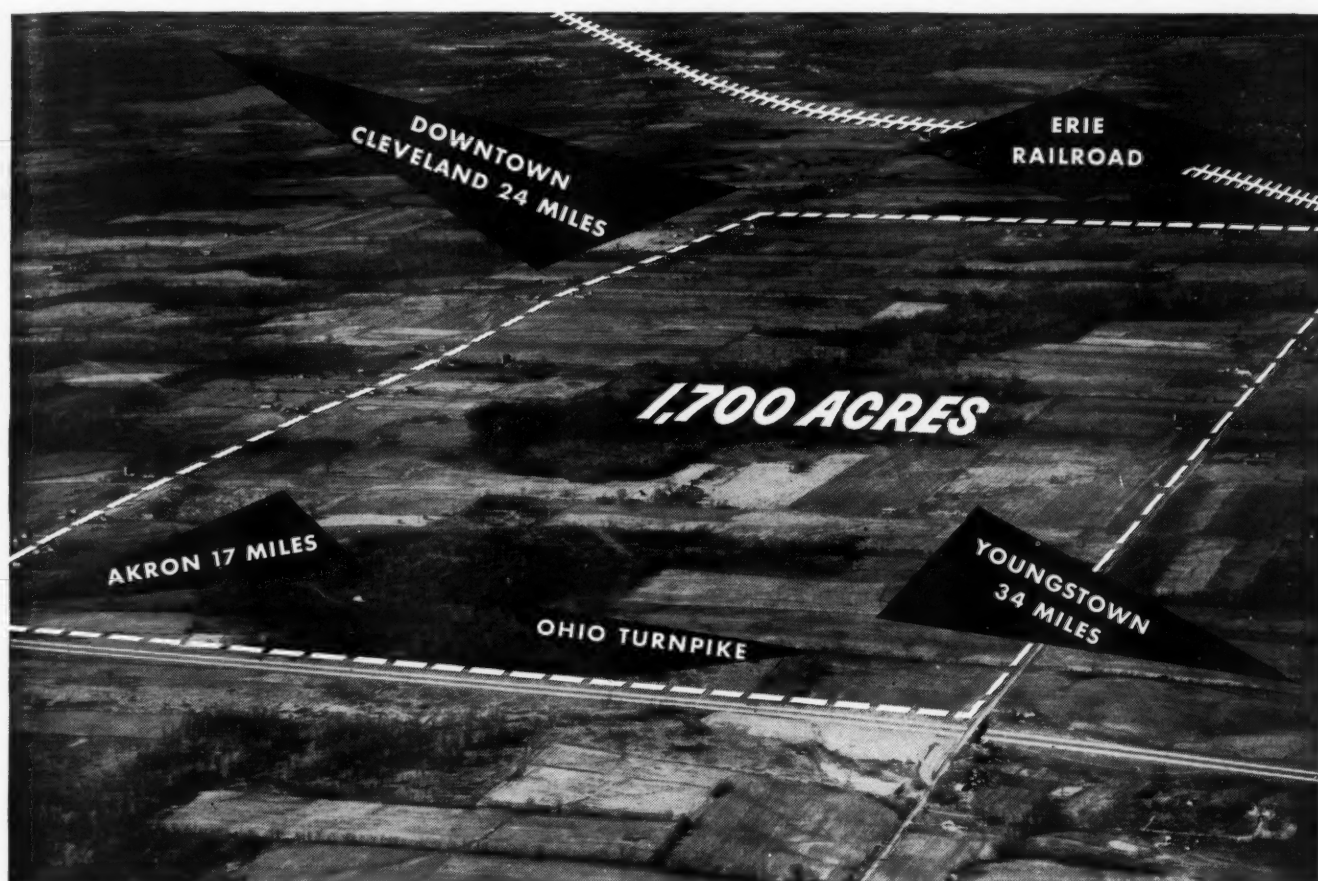
Farmington Daily Times Building, Farmington, N. M. \$120,000. Client, McHugh and Hooker, Architects.

R. W. Beck and Associates. 9375-kw addition to steam-electric generating plant; semi-outdoor design. \$1,800,000. Client, Town of Farmington, N. M.

NEW YORK

Benjamin L. Spivak, New York City. Home and Hospital for Daughters of Jacob, Bronx, New York City—rehabilitation of boiler plant. \$100,000. Client, The Daughters of Jacob.

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Apartment house, New York City—13-story, 121 apartments with indoor parking garage. \$1,600,000. Client, Slingerland & Boos.

Slocum & Fuller. 2 Broadway, New York City. \$20,000,000. Client, William Lescaze and Kahn & Jacobs.

Financial Building, New York City. \$15,000,000. Client, Skidmore, Owings & Merrill.

Sheepshead Bay High School, N. Y. \$4,900,000. Client, Holden, Egan & Assoc.

Crucible Steel Corp., Research Center, N.Y., N.Y. \$8,000,000. Client, Skidmore, Owings & Merrill.

Merrill, Lynch, Pierce, Fenner & Beane, new office building, N. Y. \$15,000,000. Client, Skidmore, Owings & Merrill.

D. B. Steinman. Highway bridge over Seneca River and barge canal to replace existing Rumsey St. Bridge, Seneca Falls, N. Y. \$400,000. Client, Village of Seneca Falls.

High level suspension bridge over South Seaway Channel of St. Lawrence River, including approach highways to existing Roosevelt Highway, near Massena, N. Y. \$5,000,000. Client, Corps of Engineers, Buffalo District.

A. D. Ateshoglou, Consulting Engineer. National Guard Armory, two units, Orangeburg, N. Y. \$1,000,000 (est.). Client, architect, James C. MacKenzie.

Farkas and Barron. Science & Engineering Building, New York University, Bronx, N. Y. \$3,200,000. Client, Marcel Breuer.

Hamilton Street Interchange, Corning, N. Y. \$3,700,000. Client, New York State Department of Public Works.

Interstate Route No. 5, Oswego County, N. Y., Seven bridges. \$1,300,000. Client, New York State Dept. of Public Works.

Luna Park Houses, Brooklyn, N. Y., New York City Housing Authority. \$18 million. Client, Kelly & Gruzen.

High School of Industrial Arts, New York, N. Y., Board of Education, City of New York. \$7,500,000. Client, Arch., William Lescaze & Kahn & Jacobs.

R. S. Krinsky & Associates, Yonkers, N. Y. New elementary school, Bronxville Heights. \$950,000. Client, Board of Education for the City of Yonkers.

Municipal housing project, North Tarrytown, N. Y. \$800,000. Client, Tarrytown Housing Authority and U.S. Public Housing Administration.

DeLuw, Cather & Brill, New York City. Northern Boulevard, Nassau County, N. Y. Design for widening and improving 4½ miles of Northern Boulevard from New York City Line to Roslyn Viaduct, Nassau County. \$7,000,000. Client, New York State Dept. of Public Works.

Martin Isaacs, New York City. Six-story fireproof building, 311-13 W. 43rd St. \$400,000. Client, Karyvon Corp.

12-story fireproof office building, 20 E.

46th St., N. Y. C. \$1,000,000. Client, Henry G. Greene, Architect.

Fred S. Dubin Associates. R.C.A. Corporation, New York City. 200,000 sq ft. Plumbing, heating, and electrical. Client, Philip Johnson Assoc., Arch.

H. A. Martin & Associates, New York City. Monticello Airport, Monticello, N. Y. Preliminary survey, location, mapping, soil borings, and preliminary plans. Associated with **Dr. Paul Rongved,** New York City. \$600,000. Client, Sidney Orseck, New York City (present owner).

Julius Schubert, Lindenhurst, N. Y. Medical Arts Building, Deer Park, L. I. \$400,000. Client, Castle Builders.

Shopping center, Smithtown, L. I. \$115,000. Client, Colonial Oaks.

Home development—350 homes—Smithtown, L. I. \$3,000,000. Client, Colonial Oaks.

Eckerlin & Klepper, Syracuse, N. Y. New women's dormitory and dining hall for Syracuse University. Nine-story reinforced concrete flat plate construction, housing for 450 students. Structural and foundation design. \$3,000,000. Client, King & King, Architects.

New technical and industrial high school for City of Syracuse. Two-story reinforced concrete waffle-grid construction, on long piles. Structural and foundation design. \$1,900,000. Client, Ketcham, Miller & Arnold, Architects.

Goodkind & O'Dea, Bloomfield, N. J. Interstate Route 5, Onondaga County, N. Y. Design of seven structures including a viaduct 1800 ft. long. \$4,900,000. Client, New York State Dept. of Public Works.

Route 17 relocation in Broome County, N. Y. from Damascus to McClure. Length of project 8 miles, limited access highway. \$6,000,000. Client, New York State Dept. of Public Works.

OHIO

Ballinger Co. and Ballinger-Meserole Co., Philadelphia, Pa. Design of warehouse and distribution center, Mansfield, Ohio. 170,000 sq ft of warehouse space including 116,000 sq ft of grocery storage, 20,000 sq ft of freezer and cooler space, and 34,000 sq ft air conditioned offices for T & A Saveway Stores. Client, Tracy & Avery Co.

Frankenberger, Junker and Lensky, Cincinnati, Ohio. "Sanitone" dry cleaning pilot plant. \$104,000. Client, Emery Industries, Inc., Cincinnati, Ohio.

William Schuller, Toledo, Ohio. Moore Ford Sales, salesroom, garage, parking on roof. \$250,000. Client, R. Moore (Nelson Thal, Architect).

St. Paul's Lutheran Church, Napoleon, Ohio. \$85,000. Client, Hahn & Hayes, Architect.

Toledo Automobile Club, new office

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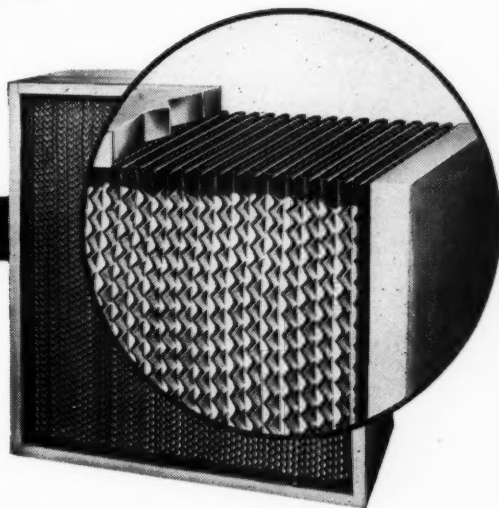
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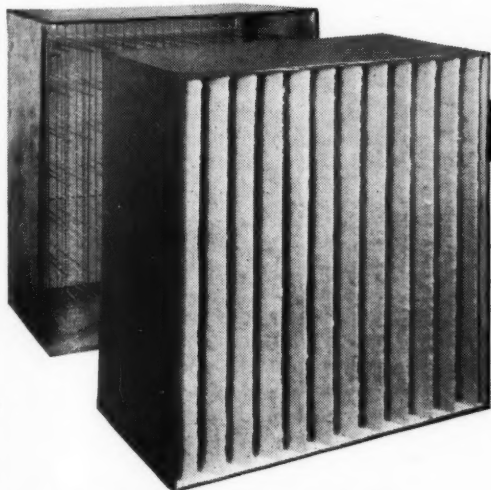
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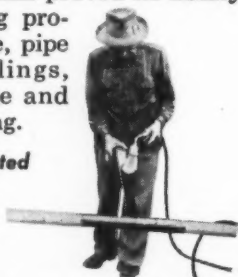
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1569 Lyons Street
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building. \$125,000. Client, Horace Coy, Architect.

University Lanes. Bowling alleys, restaurant, Toledo, Ohio. \$180,000. Client, Nelson Thal, Architect.

William Schuller, Toledo, Ohio. Rossford High School. Addition to present building, Rossford, Ohio. \$250,000. Client, Hoke & Nickerson, Arch.

Raymond J. Rosenberger, Bay Village, Ohio. Sanitary sewer system and sewage treatment plant. \$250,000. Client, Village of Orwell, Ohio.

Goodkind & O'Dea, Bloomfield, N. J. Engineering report for the relocation of 43 miles of Route 7 through Belmont, Jefferson, and Columbiana Counties in Ohio from Powhatan Point to East Liverpool. Client, Ohio State Highway Dept.

Design of two structures over Penn. R. R. and Yellow Creek for State Route 7 in Jefferson County, Ohio. \$1,250,000. Client, Ohio State Highway Dept.

Schweiger, Heapy & Associates. Mechanical engineering consultants on 12-story addition to Rike-Kumler Co. department store, Dayton, Ohio, air conditioned. Client, Lorenz & Williams, Architects.

OKLAHOMA

Leon B. Senter, Tulsa, Okla. Bakery for Continental Baking Co., Tulsa, Okla. \$1,250,000. Client, Continental Baking Co., New York City.

Shopping center, 51st Bypass and Peoria Ave., Tulsa, Okla. \$1,500,000. Client, Brook Plaza Corp., Tulsa, Okla.

OREGON

N. W. Haner & Associates, Portland, Ore. Master planning for Air Force King Salmon Airport and Galena Airport. Client, Alaskan Air Command.

Storm sewer systems, St. Helens, Ore. \$240,000. Client, City of St. Helens.

Carl E. Green & Associates, Portland, Ore. Preliminary design of water system improvements, Clarkamas County, Ore. \$1,000,000. Client, Oak Lodge Water District.

Preliminary design of sewage treatment facilities, Washington County, Ore. \$225,000. Client, Sunset Valley Sanitary District.

Preliminary design of storm sewers and sewage treatment. \$200,000. Client, City of Estacada, Ore.

Ray W. Preston. David Douglas High School. Field lighting and grandstand. Electrical work. \$95,000. Client, Annand, Boone & Lei, Architects.

Mahlon Sweet Airport, Eugene, Ore. High intensity runway lighting. \$54,000. Client, City of Eugene.

PENNSYLVANIA

Albert E. Peters Associates, Scranton, Pa. New boiler plant at Scranton Ordnance Plant, Scranton, Pa. \$600,000. Client, Corps of Engineers, U. S. Army.

Renovation of D & H passenger station to office building, Scranton, Pa. \$120,000. Client, W. Rosenstefn & Sons.

H. A. Martin & Associates, New York City. Prospect Iron Works, Parkesburg, Pa. for architect, Francis A. McKeown, Bayside, N. Y. Steel fabricating plant, mechanical and electrical work. \$200,000. Client, Prospect Iron Works, Brooklyn, N. Y.

The Ballinger Co. Modernization and expansion of Shriners Hospital for Crippled Children, Philadelphia, Pa. Client, The Shriners.

One-story manufacturing and shipping addition with 40,000 sq ft, Philadelphia, Pa. Client, John J. Nesbitt, Inc.

TENNESSEE

William J. Funk, Engineer, Chattanooga, Tenn. Emerson Building, 6-story office building, Chattanooga, Tenn. \$500,000. Client, Hunt-Caton, Associates.

Erlanger Hospital, 7-story addition. Chattanooga, Tenn. \$1,158,920. Client, Bianculli & Palm.

Baptist Church addition, Chattanooga, Tenn. \$200,000. Client, Smith & Ashby, Architects.

Bone and Joint Clinic, Chattanooga, Tenn. \$150,000. Client, Smith & Ashby, Architects.

TEXAS

Wyatt C. Hedrick, Architects & Engineers, Fort Worth, Texas. Five-story civil courts building. Air conditioned, fluorescent lighting, steam heating, Fort Worth, Texas. \$2,200,000. Client, Tarrant County, Fort Worth, Texas.

Two dormitories, men's and women's, and cafeteria. Air conditioned, Fort Worth, Texas. \$1,000,000. Client, Texas Wesleyan College, Fort Worth, Texas.

American Airlines Stewardess College, Fort Worth International Airport. \$1,500,000. Client, American Airlines.

Smith & Tao, St. Louis, Mo. Dial building, Houston, Texas. \$200,000. Client, S. W. Bell Telephone Co.

VIRGINIA

Wm. B. Gallagher, Jr., Wayneboro, Va. Five miles of interceptor sewer along South River. Five river crossings of mechanical joint cast iron pipe and two pump stations. Balance of line vitrified clay pipe, 18, 24, and 30 in. and pressure joints. Fifty percent of line below stream bed. \$500,000. Client, City of Waynesboro, Va.

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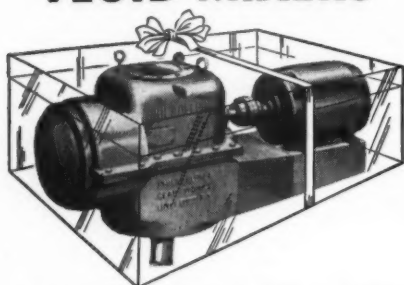
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WASHINGTON

H. E. Bovay, Jr., Spokane, Wash. Continuous plate furnace foundation. \$200,000. Client, Kaiser Aluminum & Chemical Corp., Trentwood Works, Spokane. Domestic water system modernization design. \$500,000. Client, Vera Irrigation District No. 15, Veradale, Wash.

Carl E. Green & Associates, Portland, Ore. Design of water drainage system and sewage treatment. \$1,200,000. Client, City of Hoquiam, Wash.

George M. Frese, Wenatchee, Wash. Design, build, and put into operation—diplexed picture AGC, sound clipper reception system of TV. \$1500. Client, Bay Television Co.

Design, build, and put into operation—AM field and survey and propagation study with one transmitter located at the 600 ft elevation along the Columbia River, and the other at 3700 ft. The problem is to determine the gain if any, in moving the transmitter up to the high lands. \$2500. Client, KPQ, Wenatchee.

Carey and Kramer, Seattle, Wash. Design of hydroelectric project for pulp mill and use of Sitka, Alaska. \$4,500,000. Client, Sitka, Alaska.

Design of natural gas distribution system. Joint venture with **Barnard & Burk,** Baton Rouge, La. \$1,280,000. Client, Cities of Ephrata and Soap Lake, Wash.

Report on new source of water supply for present population of 35,000. \$1,500,000. Client, Alderwood Water District, Snohomish County, Wash.

Report on new sewerage system, including sewage treatment plant. \$230,000. Client, Town of Redmond, Wash.

Addition to Lake City sewage treatment plant at Seattle. \$650,000. Client, City of Seattle, Wash.

Design and inspection of new sewerage system, including sewage treatment plant. \$175,000. Client, Town of Monroe, Wash.

WISCONSIN

Davy Engineering Co., Inc., LaCrosse, Wis. Winona Lake dredging, Winona, Minn. \$55,000.

Holmen Co-op Creamery, Holmen, Wis. Waste treatment facilities. \$20,000.

Arcadia, Wis., sewer extension. \$15,000.

La Crosse County Home & Infirmary sewer extension. \$23,000.

Mead & Hunt, Inc., Madison, Wis. Factory and warehouse, Watertown, Wis. \$400,000. Client, Klaus Mfg. Co., Milwaukee, Wis.

University Chadbourne Hall, Madison, Wis. Electrical, heating, and air conditioning. \$100,000. Client, University of Wisconsin.

Five buildings at Truax Field and Airport. \$300,000. Client, U. S. Army Corps of Engineers.

Smith & Tao, St. Louis, Mo. Hospital addition, St. John's Hospital, Milwaukee, Wis. \$200,000. Client, Ralph Ranft, Architect.

Thomas J. Higgins Associates, Inc. St. Bonaventure Minory Seminary and High School, Sturtevant, Wis. Awarded following contracts: general, \$613,500; plumbing, \$72,220; heating, \$75,100; and electrical, \$37,500. Client, Franciscan Fathers, Assumption Province.

WYOMING

Jackson & Jackson, Architects & Engineers, Salt Lake City, Utah. Complete system renovation, Union Telephone Co., Mt. View, Wyo. \$500,000. Client, Union Telephone Co.

FOREIGN

Farkas and Barron. U. S. Embassy Building, The Hague, Holland. \$850,000. Client, Marcel Breuer.

Board of Trade Building, Toronto, Canada. \$3,500,000. Client, Bregman & Hamann, Architects.

A. D. Ateshoglou, Consulting Engineer. Bermuda Theater in Bermuda. 1200 seats, steel frame. \$1,000,000 (est.). Client, architect, Urbahn, Brayton & Burrows.

R. J. Tipton Associated Engineers, Inc. Consultants, Guarico Dam, Venezuela. \$20,000,000. Client, Ministry of Public Works of Venezuela.

Design of Tuta Dam, Colombia. \$2,000,000. Client, Instituto Nacional de Aprovechamiento Fomento Electrico, Bogota, Colombia.

Airways Engineering Corp. Design plans and supervision of construction of airport terminal buildings at Quito and Guayaquil, Ecuador. \$2,000,000. Client, Government of Ecuador.

Oscar L. Aronsen. Consultation and approval of plans for one 32,000 ton and one 38,000 ton steam turbine tankers to be built in Kobe, Japan. \$12,000,000. Client, Gotaas-Larsen, Inc.

E. A. Rose, Inc., New Orleans, La. Specifications and designs for complete 200 ton sugar refinery for the Cooperativa Azucarera Salvadorena, Ltda., which will be built near San Salvador. \$2,000,000. Client, Cooperativa Azucarera Salvadorena, Ltda.

Allen K. Hamilton, Woodstock, Ill. New telephone office building and necessary outside plant. Guantanamo Bay, Cuba.

Andrew M. Fairlie, Inc., New York, N. Y. Glover Tower for chamber-plant type sulfuric acid plant for installation in Indonesia. \$25,000. Client, International Rotterdam.

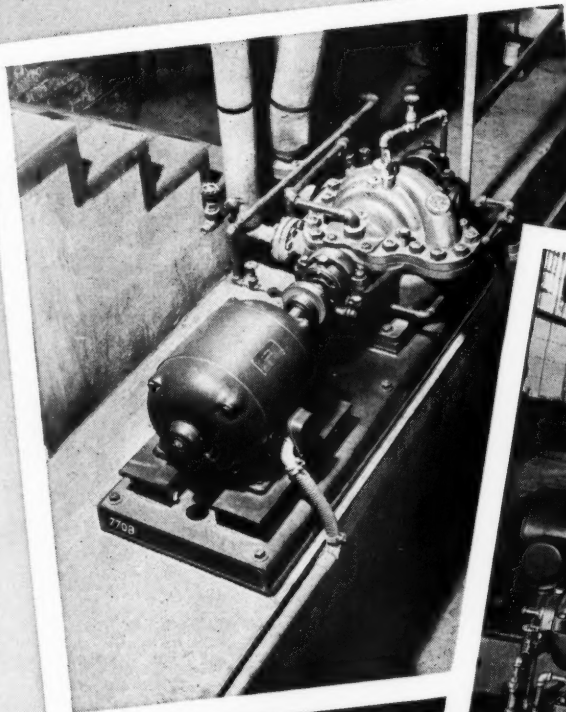
Henry Adams, Inc., Baltimore, Md. Japanese Consulate, new buildings, mechanical and electrical installations, Nagoya, Japan. \$100,000. Client, Cochran, Stephenson and Wing, Architects.

CONSULTING ENGINEER

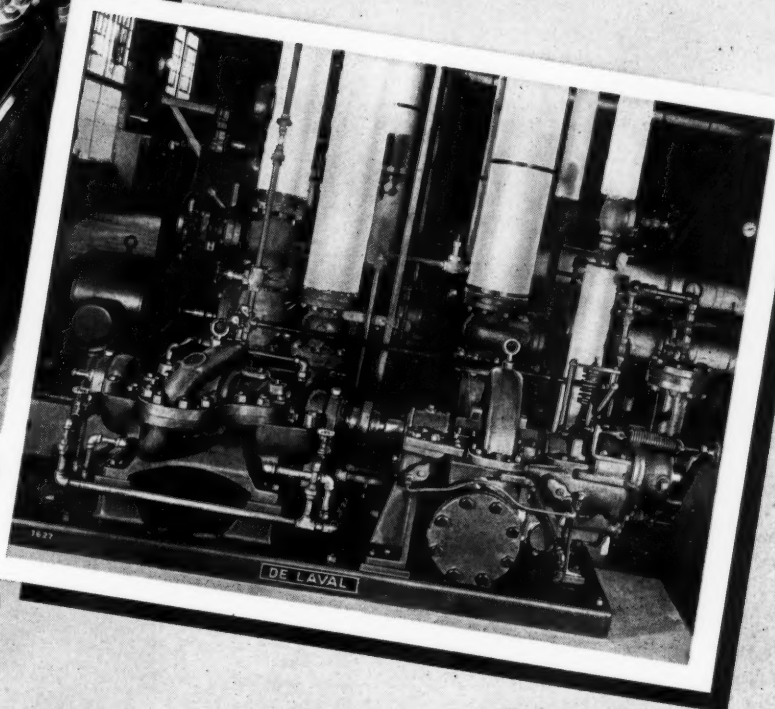
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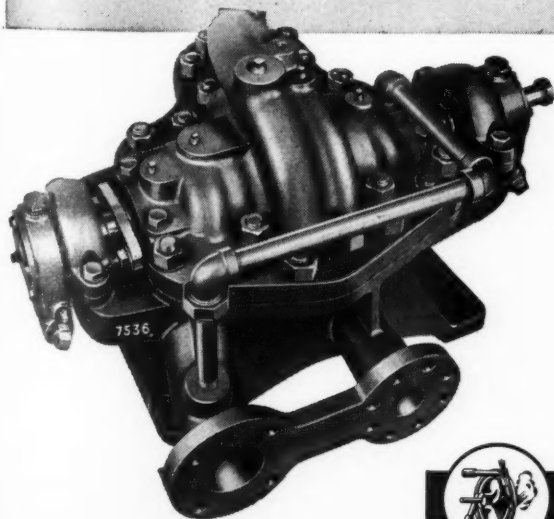
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For

Consulting Engineers

FOUNDATIONS—DESIGN AND PRACTICE, by Elwyn E. Seelye; John Wiley and Sons, Inc.; 485 pp.; \$16.00.

Reviewed by John A. Blume, Consulting Civil and Structural Engineer, San Francisco, Calif.

This new book is a comprehensive undertaking on the subject of foundations in its many aspects including design, design data and criteria, costs, specifications, and field practice. The experienced foundation engineer may be amazed at such a bold attempt, not only because of the responsibility and diversity of the subject, but also because of the necessity and difficulty of reconciling

a proposed foundation with complex underground conditions. However, the author has produced a practical and authoritative book with the aid of his many years of practical experience and with an impressive list of assisting experts in various divisions of the subject. An added feature is a system of warnings, called "red lights," for the inexperienced reader.

The objective was to provide a single volume for the designing engineer, builder, inspector, architect, teacher, and student. There is no doubt that all of the above persons would find the book useful. It is convenient, well indexed, to the

point, and generously illustrated and tabulated. Most subjects of necessity are treated briefly but there is a great deal of information between the covers. Some repetition is involved so that the designer will have close at hand necessary data on field methods which should be factors in his design decisions. Sections on field practice, for others than the designer, present field methods again but in more scope and detail.

There are nineteen chapters, with the following headings: Introduction; Push-Button Design of Spread Footings and Pile Caps; Detail Foundation Design; Retaining Walls; Bridge Piers and Abutments; Foundations for Pipes, Conduits, and Culverts; Dams and Reservoirs; Evaluation of Bearing Power of Soil; Construction Methods (2); Foundations for Light Masonry; Soil Mechanics; Embankments and Pavements; Field Practice; Costs; Specifications; Exercising Engineering Judgment; Factual Data; and Appendix. Some of the material may be found in Mr. Seelye's *Data Book for Civil Engineers* (three volumes).

Foundations—Design and Practice condenses and effectively presents in useful form a great deal of information, theoretical and practical. It is hoped that the student reader will appreciate this but will also realize that no book can supplant, in the diversified and complex field of foundations, sound training in fundamentals, years of design and field experience, and good engineering judgment based upon all pertinent data.

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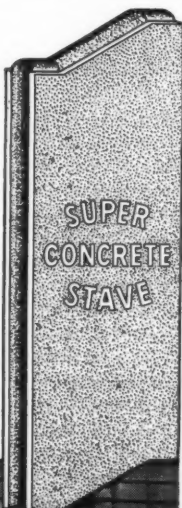
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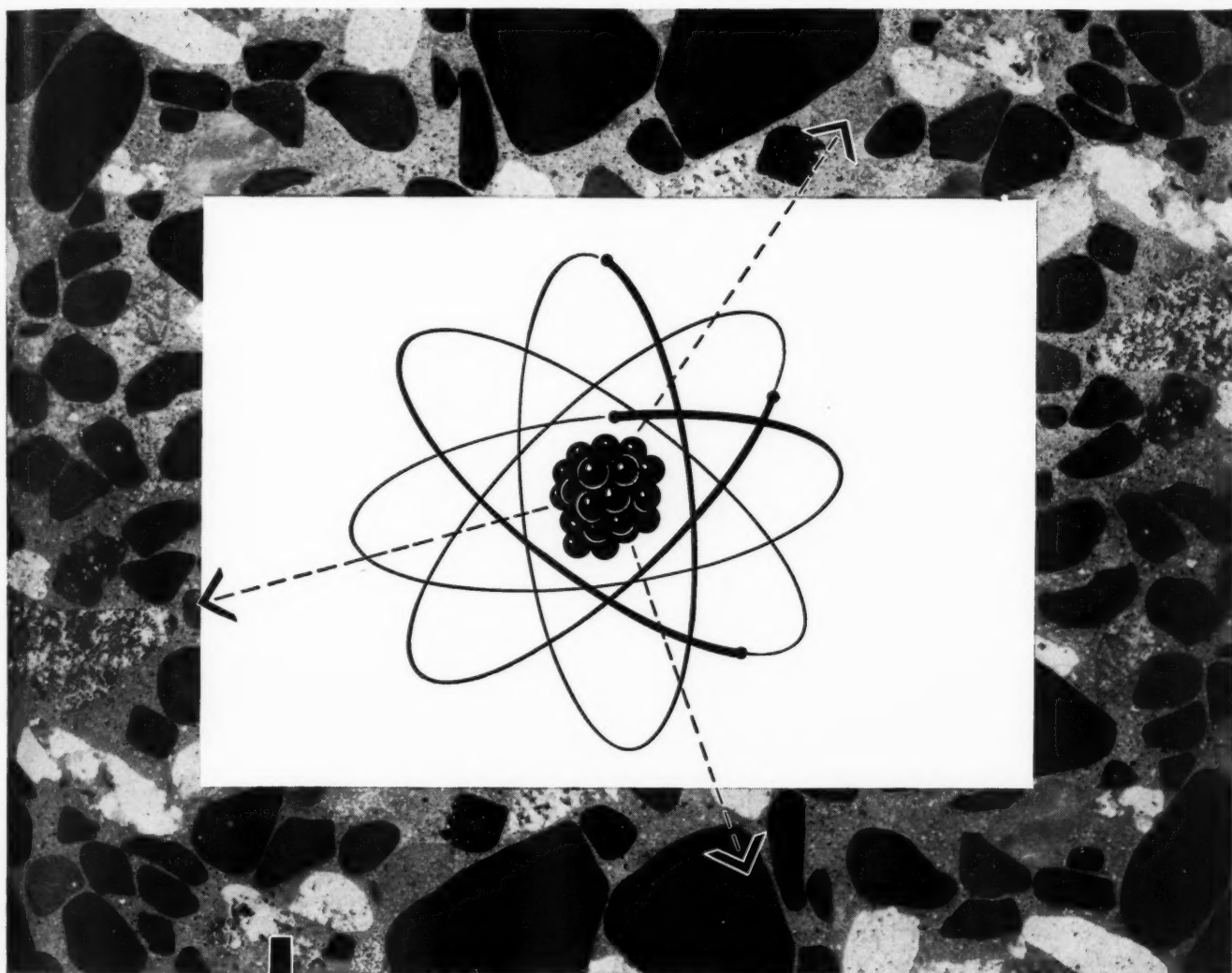


CHEMICAL MARKET RESEARCH IN PRACTICE, edited by Richard E. Chaddock; Reinhold Publishing Corp.; 196 pp., paper bound, 5 x 7½ in.; \$3.00.

Reviewed by John B. Calkin, Director of Market Research, Foster D. Snell, Inc.

This survey of the chemical industry is a collection of lectures given by the authors to college students. It is a book of importance for students, members of the industry, and for the layman because the choice of subject matter and the qualifications of the authors place this basic industry in perspective. Moreover, the authors present their experiences and ideas in simple, clear language—the emphasis being upon acquainting people with the current state of industry—which makes the book highly readable.

Among chapters of special interest are those devoted to making surveys, the utilization of surveys in making market analyses, and the role market research plays in policy planning and finance. The limitations of market research are described in the chapter "The Human Factor in



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High-density concrete, an efficient and practical radiation shielding material, is destined for wide use in nuclear reactors.

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Chemical Market Research" by focusing attention upon the shortcomings inherent in all human beings. Included also is an indication of the qualities needed for successful employment in marketing research. Another chapter concerning the effective utilization of literature gives valuable directions in lining up the facts and figures of statistics.

For consulting engineers the book will provide comprehensive background information on the subject of chemical market research. The book points out the specialized thinking of the field and the direction in which it is going.

The chapter "How To Do Effective Field Work" could be profitable reading to any engineer who may be concerned with tactics and strategy in his approach to finding facts and obtaining information by the interview technique.

LEGAL PROBLEMS IN ENGINEERING, by Melvin Nord; John Wiley & Sons, Inc.; 391 pp.; \$7.50.

Reviewed by Albert Woodruff Gray

The author, Dr. Melvin Nord, has chosen wisely the better of two methods in the presentation of this subject in a form of permanent value.

He has set out clearly and succinct-

ly the basic principles affecting engineering law. He has not crowded his pages with concrete examples of the application of those principles, leaving to his readers the task of deducing from those examples the basic legal principles.

It is told of Chief Justice Marshall that when he returned to his chambers with Justice Story after a session of the Supreme Court, he supplemented the statement of his concept of the law applicable to the appeals to which they had both been listening, with, "Story, this is the law. Now you find the precedents."

Here Dr. Nord has stated the law and furnished the reader with the needed references illustrative of the application of those legal principles to current conditions.

Arguing an appeal for the first time a young attorney prefaced his remarks with, "Your Honors, the law as I understand it, is an exact science."

Leaning across the bench the grey haired presiding justice laid aside his glasses. "Counselor, would you mind quoting your authorities?"

Court decisions, the application of the law to circumstances current at that time, shift with the years. The underlying principles of right and justice, though perhaps clothed in different dress with succeeding gen-

erations, remain essentially unchanged. In England at one time a hundred and sixty eight crimes were punishable with death. All of such offenses probably are crimes today but the enormity of the offenses and the relative value of human life has changed, forcing a modification in the application of the basic principles of right and wrong.

A former judge of the United States Court of Appeals, Leonard Hand, has written, "I should like to have every court begin, 'I beseech ye in the bowels of Christ, think that ye may be mistaken.'"

Mistakes in the law lie not in the concept of right and wrong, but in its application in the changing valuation of public opinion. In the writing of an eminently practical and useful book, the knowledge of both law and engineering have served the author well with a corresponding benefit to his readers.

ALSO AVAILABLE

CHEMICAL PROCESS INDUSTRIES, 2nd Ed., by R. Norris Shreve; McGraw-Hill Book Co., Inc.; 1004 pp.; \$11.50.

Modern methods used in the manufacture of chemicals and chemical products—broken down into unit processes and operations by convenient flow sheets—are discussed from the consultant's viewpoint. Mr. Shreve, himself, is a consulting chemical engineer.

Such important factors as data on chemical and physical changes and reactions, economics and costs, and energy and power are covered. Where figures were available, quantities of materials required to produce the finished product are given.

The book covers the manufacture of chemicals themselves, and includes descriptions of industries producing plastics, synthetic fibers, ceramics, paints, explosives, and pesticides.

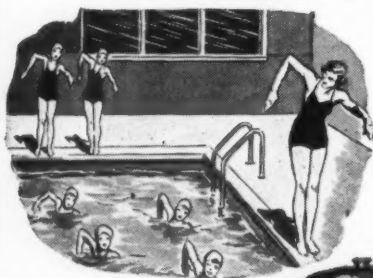
"Firm Specifications and Their Effect on Building Codes," 12 pp., is a reprint of a talk given by Kenneth M. Wilson, Chief of the Electrical and Mechanical Engineering Div., E. F. Klingler & Associates, at the annual meeting of ASHAE. It is available free of charge from the Fred H. Schaub Engineering Co., 2110 So. Marshall Blvd., Chicago 23.

STANDARD AND SIMPLIFIED DRAFTING PRACTICES; American Machine & Foundry Co.; 56 pp.; free of charge.

Comparative tests were made at the AMF Buffalo plant between standard and simplified drafting practices. This booklet gives the results of the tests. Both standard and simplified drafting methods are presented in the book so that they may be compared. For a copy, write to AMF, Public Relations Dept., 261 Madison Ave., New York 16.

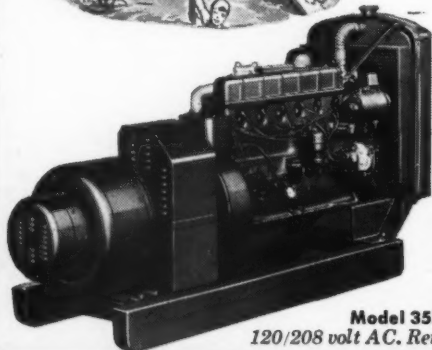
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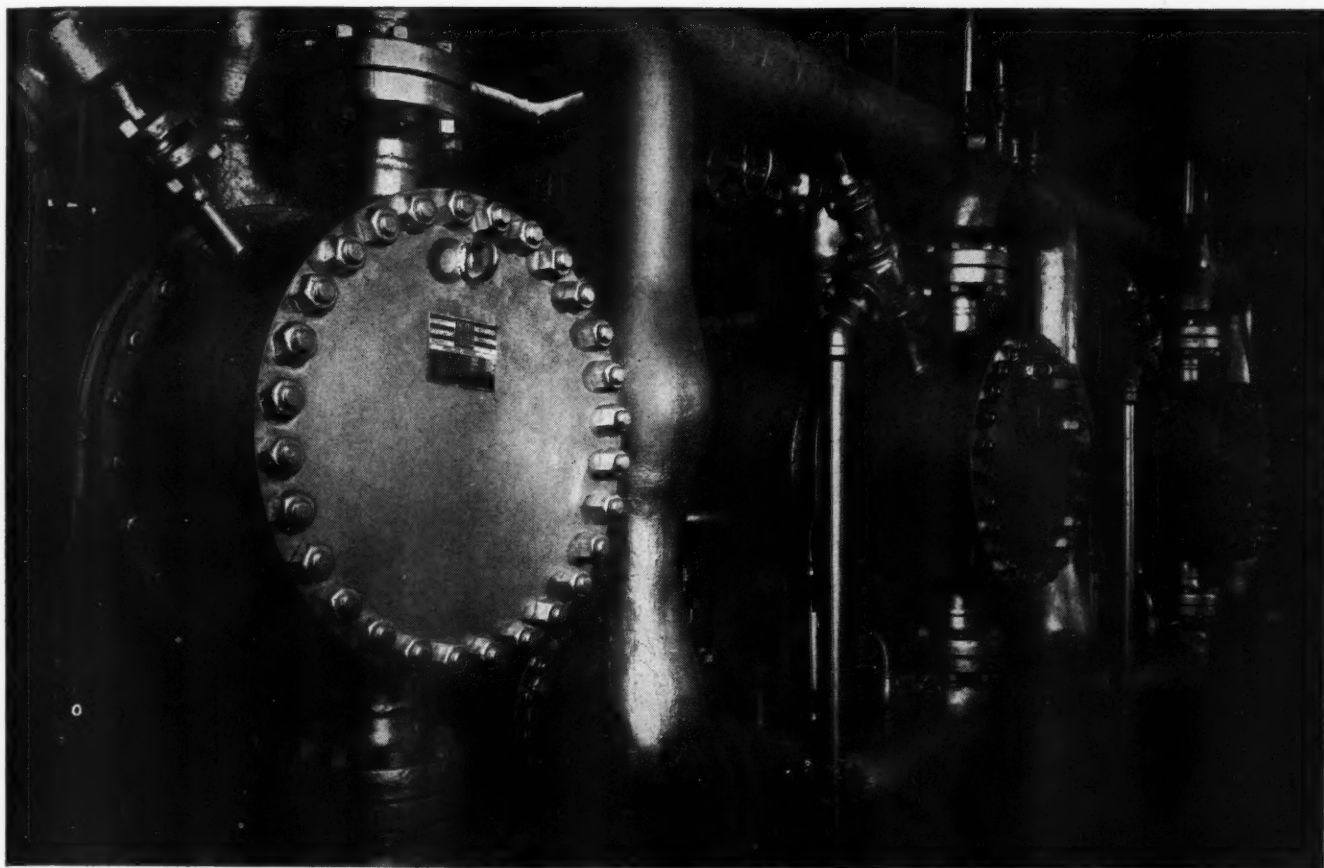


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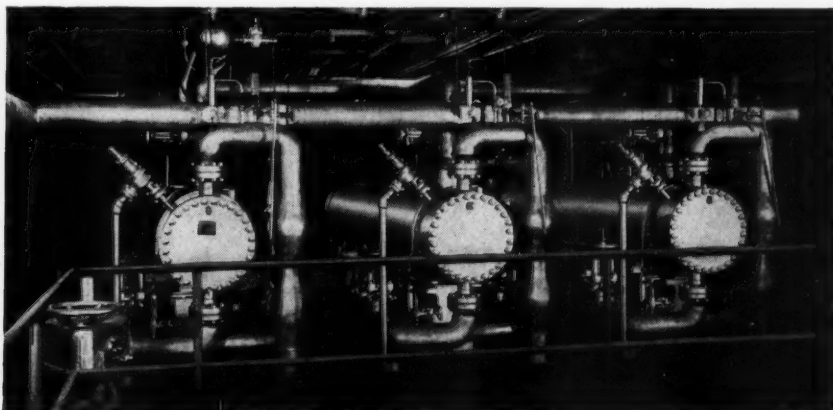
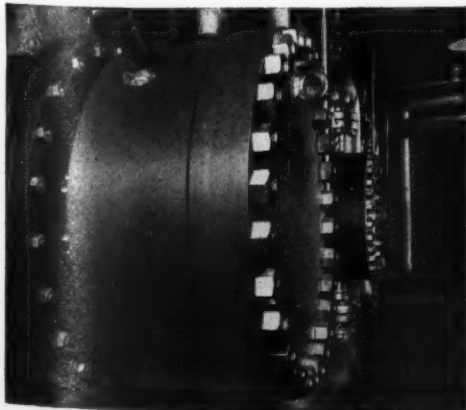
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Engineer-Editor

CONSULTING ENGINEER is enlarging its editorial staff. We need a young man with an engineering degree (preferably civil or electrical) who has had experience in report writing or writing for publication. Experience in a consulting engineer's office will be helpful. The position will be that of field editor in the East, working out of New York City, visiting offices of consulting engineers, and writing and editing articles. Please send full history, photograph, and indication of salary requirements.

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"ASHAE Code for Testing and Rating Heavy Duty Furnaces and Direct-Fired Unit Heaters," published by the American Society of Heating and Air-Conditioning Engineers, is applicable to forced warm air furnaces and direct-fired unit heaters having output ratings in excess of 250,000 Btu an hour. It covers purpose, scope, definitions, rating limits, testing equipment, testing procedures, and rating procedures. For free copies, write to the Society at 62 Worth St., New York 13.

"The Highway Construction Industry in a Long Range National Highway Program," published by the American Road Builders' Association, is a revised edition of the Task Force Report presented at the ARBA annual convention in January, 1955. \$2.00 from ARBA, World Center Bldg., Washington 6, D. C.

PROFESSIONAL ENGINEER'S EXAMINATION QUESTIONS AND ANSWERS, by William S. La Londe, Jr.; McGraw-Hill Book Co., Inc.; 462 pp.; \$6.50.

This selection of over 500 questions was drawn from recent, actual examinations for Professional Engineer License, Land Surveyor License, and Engineer-in-Training Certificate. In addition, addresses of State Registration Boards are given with information on when and how to apply for examination.

"Vermiculite Fire Resistance Ratings for Plaster, Acoustical Plastic, and Concrete," published by the Vermiculite Institute, shows fire-proofing details for both concrete and steel roof and floor assemblies; columns, beams, girders and trusses; panel or spandrel walls; and solid plaster partitions. Included are new assemblies that have proved more economical than earlier types. For a free copy, write to the Institute at 208 South LaSalle St., Chicago 4, Ill.

REACTOR SHIELDING DESIGN MANUAL, Edited by Theodore Rockwell, III; Office of Technical Services, Dep't. of Commerce; 465 pp.; \$2.10.

This book is one of a series sponsored by the Naval Reactor Branch of the Atomic Energy Commission to evaluate and put into systematic form the technology being developed in the Naval Reactors Program and Pressurized Reactor Program. It describes the procedures and data that are used in the design, construction, and testing of shielding for the reactor plants of the NRP and for the Shippingport pressurized water reactor. Material is organized in the approximate order that the designer would have to accumulate it in developing a shield design of his own.

SIMPLIFIED PROBLEMS IN STRENGTH OF MATERIALS AND STRUCTURAL DESIGN, by Ephraim Viertels; Arco Publishing Co.; 636 pp.; \$5.00.

Prepared as a reference book for structural engineers, it is divided into three parts. Part I covers: simple stresses; graphic statics; center of gravity; reactions of beams, girders, roof trusses, and arches; shear and shear diagrams; bending moment and moment diagrams; influence lines; and torsion. Part II includes: elements of theory of bending; moment of inertia; design of steel and wooden beams; floor design; rivets and riveted connections; welding and welded connections. Part III covers problems in the: design of plate girders, columns, bearing plates, and roof trusses.

"Lighting for Commercial Kitchens," eight-page report prepared by the Illuminating Engineering Society, covers all phases of lighting for food handling and preparation in restaurants and other institutional kitchens. It includes recommended lighting levels; brightness ratios; reflectances of walls, ceilings, and floors; and selection of types of fixtures providing ease of maintenance as well as proper illumination characteristics. Copies are \$.15 each from the Society's Publications Office, 1860 Broadway, N. Y. 23, N. Y.

FILMS

"OPPORTUNITIES UNLIMITED," Life Magazine, sound and color, 18 min.

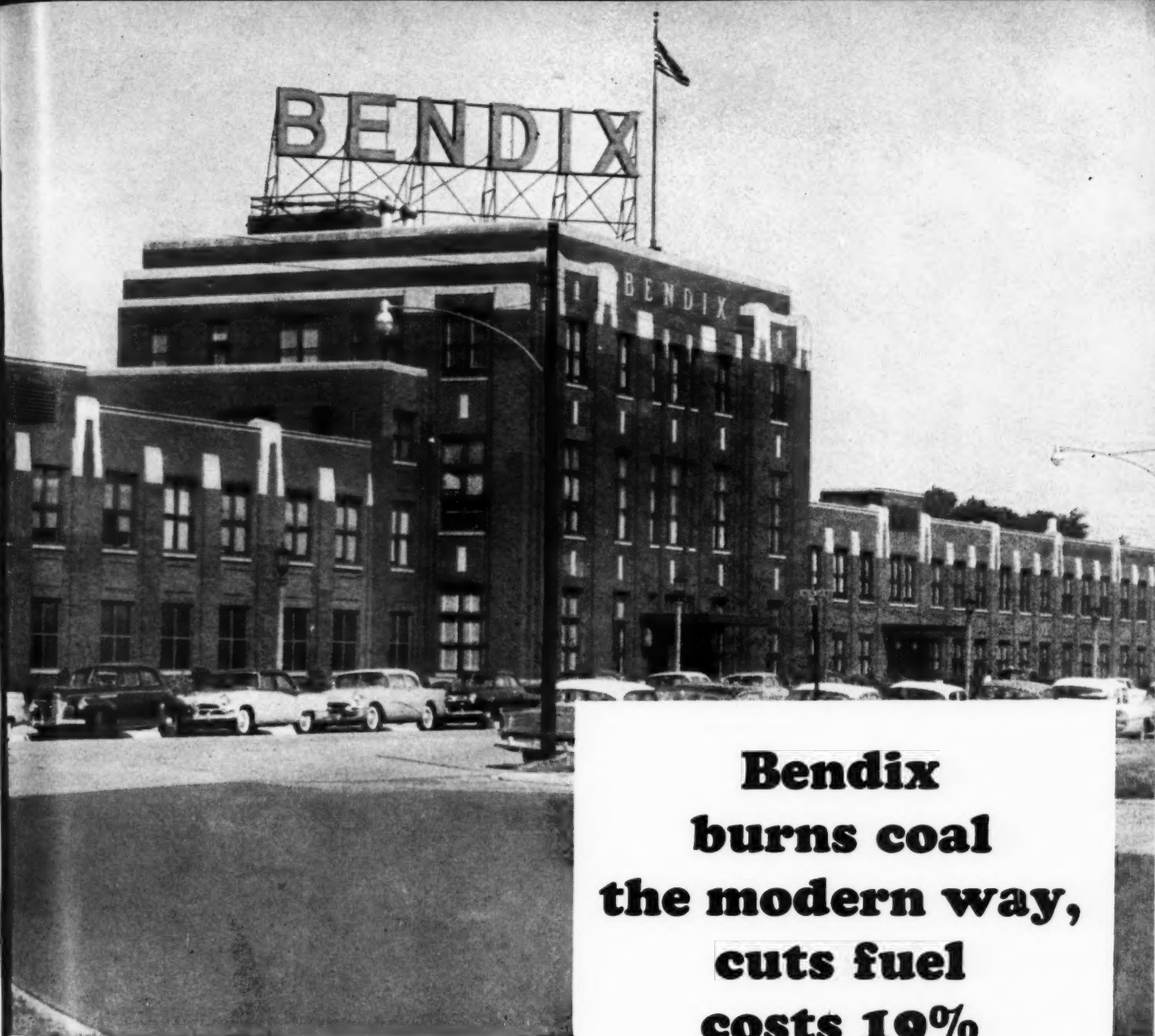
This film forecasts opportunities for business in the fields of highway construction, urban re-development, new products, and development of suburbs.

"GOODBYE STEVE," General Electric Co., sound and color, 30 minutes.

This is the latest film in G-E's "More Power to America" series. It dramatizes an electrical engineer's efforts to modernize the electrical distribution system in his employer's manufacturing plant.

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facts you should know about coal

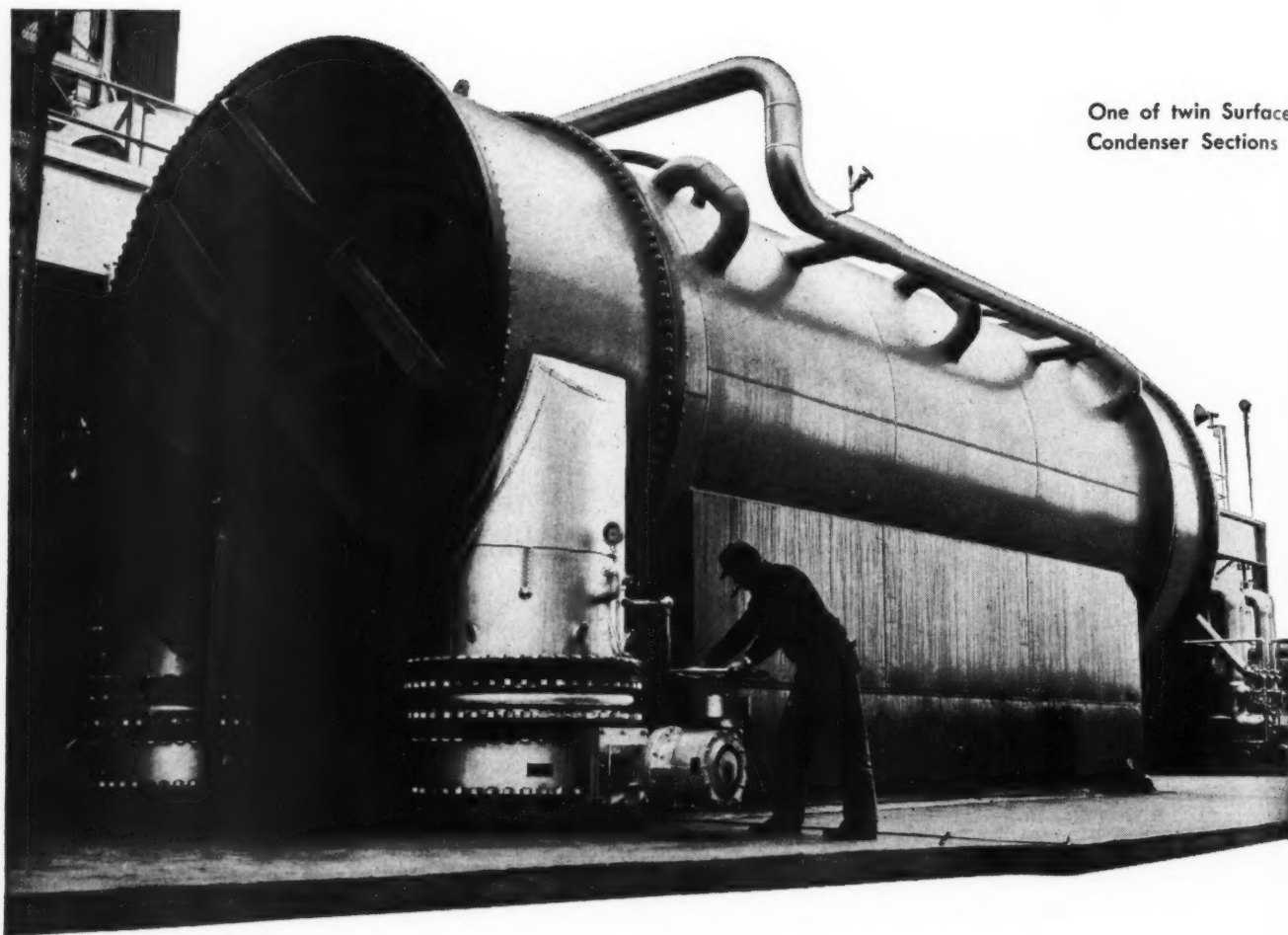
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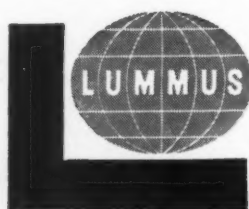
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consulting engineers' calendar

Date	Sponsor	Event	Location
Nov. 7	American Institute of Consulting Engineers	Monthly Luncheon Meeting	Engineer's Club New York, N. Y.
Nov. 7-8	Instrument Society of America, Philadelphia Section	Symposium on Automatic Data Logging Systems	Bellevue-Stratford Hotel Philadelphia, Pa.
Nov. 8-9	University of Wisconsin	Drafting Practices Institute	Campus Madison, Wis.
Nov. 12-16	National Industrial Development Exposition, Inc.	Exposition	New York Coliseum New York, N. Y.
Nov. 15-16	National Association of Corrosion Engineers	Technical Symposium	Hotel Statler Detroit, Mich.
Nov. 25-30	American Society of Mechanical Engineers	Annual Meeting	Hotel Statler New York, N. Y.
Nov. 26-30	American Society of Mechanical Engineers	National Exposition, Power and Mechanical Engineering	New York Coliseum New York, N. Y.
Nov. 27	American Institute of Consulting Engineers	Annual Dinner	Waldorf-Astoria Hotel New York, N. Y.
Dec. 5	American Institute of Consulting Engineers	Monthly Luncheon Meeting	Engineers' Club New York, N. Y.
Dec. 6-7	Armour Research Foundation of Illinois Institute of Technology	Modern Builders Conference	Prudential Building Chicago, Ill.
Dec. 9-12	American Institute of Chemical Engineers	Annual Meeting	Hotel Statler Boston, Mass.
Jan. 23-24	University of Wisconsin	Industrial Lighting Institute	Campus Madison, Wis.
Jan. 28-Feb. 2	American Road Builders' Association	1957 Road Show and Convention	International Amphitheater Chicago, Ill.
Feb. 25-March 1	American Society of Heating and Air-Conditioning Engineers	Annual Meeting and Heating and Air-Conditioning Exposition	International Amphitheater and Conrad Hilton Hotel Chicago, Ill.

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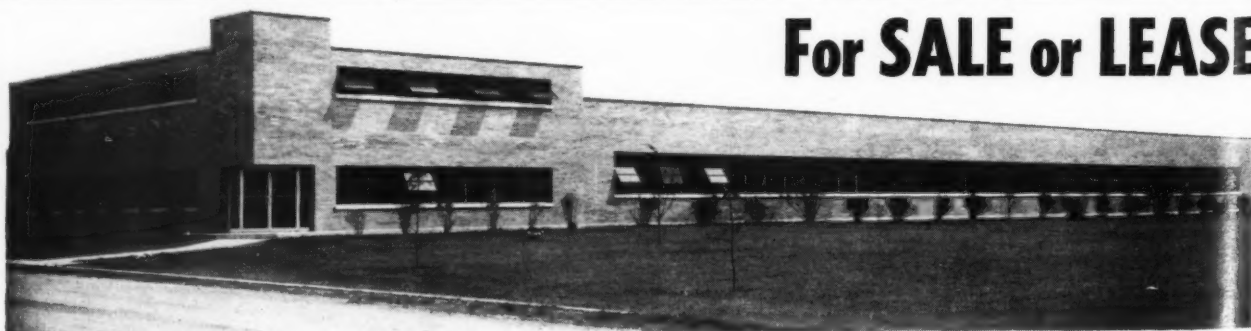
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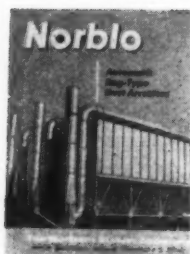
This supplement provides a current and detailed description of bulletins, catalogs, and other literature offered by advertisers in CONSULTING ENGINEER. Products and services offered are grouped into the general categories shown below. A full index is provided on the back cover. Keep this supplement in the front of your catalog file and refer to it when you need product data. Four postcards are provided for ordering copies of bulletins you need.

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Bring your Technical Reference Files up to Date

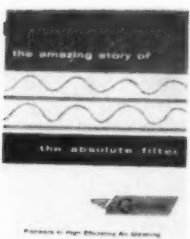
Part 2 November 1956

The Consulting Engineer's Professional Magazine



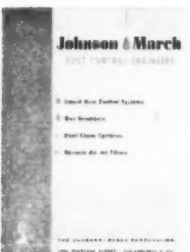
1—Automatic Dust Collectors

How the Norblo automatic bag-type dust collector can provide continuous operation at full capacity is explained in four-page folder 164-5. Dimensions and capacities are listed in tabular form. A flow diagram explains how the unit works. Each part of the collector is shown separately with a description of advantages. *The Northern Blower Co.*



2—Industrial Air Filters

"The Amazing Story of the Absolute Filter," eight-page bulletin 106A, tells about the development of the filter for the Atomic Energy Commission and its subsequent "declassification" for use in industry where critical air cleaning problems exist. Construction, dimensions, applications, and ratings are given. *Cambridge Filter Corp.*



3—Dust Control Equipment

General catalog GC 3755 has been prepared specifically for consulting engineers. It points out the broad range of dust control equipment and engineering services offered by this company. It covers Liquid Dust Control Systems, Gas Scrubbers, Dual-Clone Cyclones, Reverse Air Jet Filters, and other units. *Johnson-March Corp.*



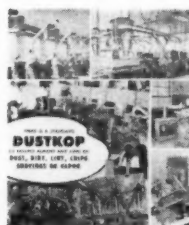
4—Dust Collection Cyclones

Twelve-page bulletin C-103 describes and illustrates Buell Cyclone and manifold design for the scientifically efficient collection or recovery of industrial dusts. Dimensions up to 52 in. in diameter, capacities, and fractional efficiencies are given in tabular and graphic forms. Operation is discussed. *Buell Engineering Co.*



5—Dust Collectors

Outstanding features of the National Hydro-Filter Dust Collector are described in four-page bulletin 556. Ease of operation and maintenance, versatility, cost factors, separating efficiency, controls, and construction and design are discussed. Dimensional data, specifications, and drawings also are provided. *National Dust Collector Corp.*



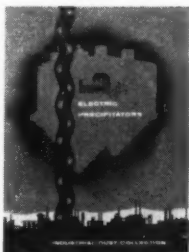
6—Dust Collectors

Bulletin 636-B contains illustrations and specifications on the complete Agat line of Dustkop Dust Collectors. It lists applications and tells how to install. It also shows how to figure size and type of equipment needed to solve any dust collection problem. Capacities are 300 to 10,050 cfm for each unit. *Agat Mfg. Co.*



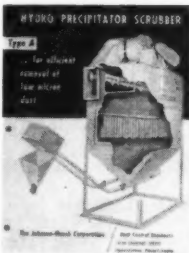
7—Centrifugal Dust Collectors

Improved design of the Norblo High Efficiency Low Static (H.E.L.S.) centrifugal dust collector includes deeper body and improved proportions and does away with dampers frequently used to overcome back pressure, according to four-page bulletin 104-3. Capacities and principal dimensions are listed. *The Northern Blower Co.*



8—Electric Precipitators

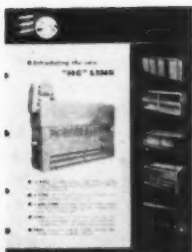
"Buell SF Electric Precipitators," bulletin 104, explains and illustrates industrial dust collection by electric precipitation and precipitator design features that result in extra efficiency. It also fully describes simplified construction, exceptional electron emission, and absence of tendency to produce "puffing." *Buell Engineering Co.*



9—Wet Scrubbers

Twelve-page catalog HP 955 describes the new Type A Hydro-Precipitator—a wet scrubber that effectively collects dust under five microns in particle size. In pilot plant tests, the units have attained efficiencies up to 95 percent on dusts, 78 percent of which were under two microns in size. Bulletin lists applications. *Johnson-March Corp.*

To order personal copies of these bulletins, please fill out the card between pages 4 and 5 or 24 and 25.



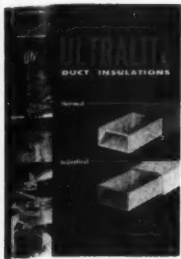
10—Heating and Ventilating

Catalog 344, 28 pages, describes and gives specifications on heating and ventilating units with air deliveries from 1280 to 32,500 cfm and with heating capacities from 26,200 to 2,227,000 Btu/hr. Diagrams illustrate basic unit, fan discharges, and arrangement of all accessories. Complete engineering tables are given. *McQuay, Inc.*



11—Heating Systems

Eight-page bulletin 2101A tells you how Dunham-Bush Vari-Vac and Metro heating systems provide more comfort with smaller fuel bills in factories, stores, hospitals, schools, churches, office and apartment buildings. Actual installations are pictured, specific savings detailed, and components described. *Dunham-Bush, Inc.*



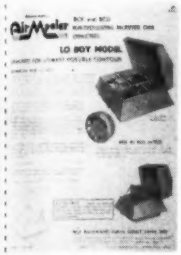
12—Duct Insulations

"Ultralite Duct Insulations," eight-page bulletin ULD-1055, introduces duct insulation and liner of long textile-type glass fibers bonded together with a thermo-setting plastic resin. It gives suggested thicknesses, thermal efficiency, table of facings for duct insulation, suggested applications, and specifications. *Gustin-Bacon Mfg. Co.*



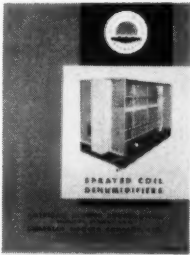
18—Packaged Boilers

The Dutton EconoTherm boiler has everything you're looking for in a compact, automatic packaged boiler, according to four-page bulletin ECA-1054. In sizes from 300 hp, the units feature modern welded boiler shell, stainless air ring, rotary combustion, and induced mechanical draft. *Dutton Boilers, Div. Hapman-Dutton Co.*



13—Non-Overloading Exhausters

AirMpelor Lo Boy non-overloading backward curb exhausters with the new low silhouette, Hi Boy exhausters, pressure blade draft inducers, and Lo Boy roof or relief exhausters are featured in four-page bulletin 100. Dimensions and curb details in inches and a complete list of specifications are provided to simplify choice. *C. L. Ammerman Co.*



19—Sprayed Coil Dehumidifiers

The new central station type sprayed coil dehumidifiers are presented in 20-page bulletin 7827-H. Detailed information is given on selection for specific applications, with formulas, tables, and curves. Installation drawings give basic dimensions and show the optional and standard arrangements available. *American Blower Corp.*



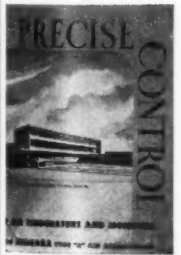
14—Grilles

The Uni-Flo Model ST Grille, designed for continuous line installation under large windows to prevent cold convection currents, is described in four-page catalog F-7757. Use for heating, ventilating, and air conditioning school rooms, hospitals, and other buildings with large glass areas is covered. *Barber-Colman Co., Uni-Flo Div.*



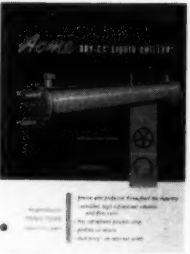
20—Steam Humidifiers

"Humidification for Profit," 16-page bulletin 500, presents statistics that show how relative humidity affects hygroscopic materials, health and comfort, and formation of static electricity. Schematic diagrams and sectional drawings demonstrate operation of electrically and air operated steam humidifiers. *Armstrong Machine Works.*



15—Air Conditioning

Precision control of air temperature and moisture enables your client to produce his product in any climate, at any season, according to six-page bulletin 122. The Type "A" air conditioner described, for drying or moistening of air, is shown in typical installation photographs. Drawing points out operation. *Niagara Blower Co.*



21—Liquid Chillers

Applications of Dry-Ex liquid chillers with star-insert tubing or plain tubing for air conditioning and refrigeration systems are listed in 16-page catalog 600-A. Construction details, engineering specifications, selection data, and procedure and selection curves are given, with principal dimensions and line drawings. *Acme Industries, Inc.*



16—Modern Hospital Generators

Fully automatic packaged steam generators for modern hospital buildings are described in four-page bulletin 514. It tells how to choose the boiler best suited for the conditions. Typical installations are shown in photographs of units operating under a wide variety of service conditions and using oil or gas. *Johnston Brothers, Inc.*



22—Rotary Roof Ventilator

Positive powered ventilation when the need arises or economical gravity exhaust of contaminated air are the two-fold possibilities with the Swartwout Airjector, described in eight-page bulletin AJ-2. Standard type, in 13 sizes and 100 capacity variations, are detailed, as is the "very quiet" model for special uses. *The Swartwout Co.*



17—Air Filters

"The New Cambridge Aerosolve Air Filter," four-page folder, introduces a high efficiency, low pressure drop system of air filters designed for multi-filter banks in comfort and industrial ventilation or air conditioning supply systems. Filter characteristics, advantages, operation, and application data are given. *Cambridge Filter Corp.*



23—Storage Heaters

Bulletin 40B, 16-pages, has been written to facilitate selection of Type K Storage Heaters for conditions normally found in buildings of various classifications. Typical layouts are included along with tables of pressure thickness, vertical and horizontal storage heater dimensions, and capacities. *Whitlock Manufacturing Co.*



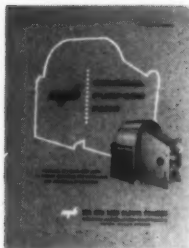
24—Gravity Roof Ventilators

The Swartwout Contouramic Airmover, a new extra-low roof ventilator of the extended heat valve type, is described in four-page bulletin 312. Application information, capacity, dimensions, and weights are included along with data on drainage, air flow, damper operation, and installation detail drawings. *The Swartwout Co.*



30—Bell-Ex Roof Ventilator

A centrifugal roof ventilator aerodynamically designed to exhaust against high resistance and offering flexibility, space-saving, and economy is illustrated and described in four-page bulletin 565. Capacities and dimensions are included, together with descriptions of propeller-type roof ventilators for lower resistances. *The New York Blower Co.*



25—General Purpose Fans

Portable, self-contained general purpose fans of medium capacities for ventilating and industrial applications are covered in 12-page bulletin 563. Condensed capacity tables, fan dimensions, fan discharge views, and lists of material specifications are given, along with suggested applications for each type of unit. *The New York Blower Co.*



31—Sill-Line Radiation

Publication 102, 20 pages, explains the Nesbitt Sill-Line Radiation . . . a new concept in high capacity finned radiation featuring four enclosure styles available in five lengths from two to eight feet. Equipment and accessories are described and IBR ratings, construction details, and selection data is included. *John J. Nesbitt, Inc.*



26—High Pressure Air Systems

Bulletin K33, 48 pages, makes available to the engineer comprehensive information on the use of high pressure air transmission systems—when and where they should be used, gives typical layouts, detailed data for design of such a system, data on sound levels, temperature differentials, and air distribution. *Connor Engineering Corp.*



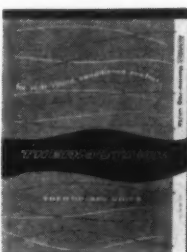
32—Roof Ventilators

Bulletin DR-38-55, 16 pages, contains six full pages on how to select a roof ventilator, covering rate of air change method and heat load method. It includes a volume chart, latitude correction chart, and solar heat gains tables, plus data on the Power Flow Roof Ventilator. *DeBothezat Fans Div., American Machine and Metals, Inc.*



27—Airfoil Blade Fans

Bulletin FD 106 describes a new series of airfoil blade fans with 92 percent mechanical efficiency, suitable for forced draft as well as industrial air moving service. Fans are available with three different airfoil wheels for varying pressure and capacity requirements as well as with three semi-air-foil wheels. *Buffalo Forge Co.*



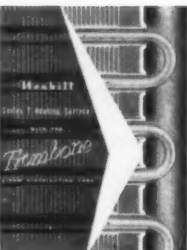
33—Mixing Chambers

Thermo-Reg mixing and sound attenuating chambers for high-velocity air conditioning systems are described in this 12-page bulletin. Performance data is presented for two basic types: for installation in ceilings or corridors and for under windows. Comprehensive engineering data on high-velocity systems is given. *Thermotank, Inc.*



28—High Velocity Jet Outlet

This eight-page bulletin describes four types of Punkah Louvres, jet outlets for high-velocity air delivery. Universal movement of the louvre ball provides finger-tip directional control and complete shut off. Its long throw reduces ducting. Bulletin gives specifications, performance data, and selection guide. *Thermotank, Inc.*



34—Performance Tests

Publications 305-1 and 345-1 describe special performance tests and results reported on Nesbitt Series "T" Heating Surface with the Trombone Steam Distributing Tube. Tests conducted with sub-freezing entering air conditions under all degrees of modulated steam control proved uniform final temperatures. *John J. Nesbitt, Inc.*



29—Induced Draft Fans

Bulletin DB-44-56, 20 pages, gives all manufacturers' organizations boiler code ratings reduced to their common relationship of Btu/hr delivered. Use of the bulletin simplifies analyzing induced draft fan requirements. It also gives complete data on the Induced Draft Bifurcator. *DeBothezat Fans Div., American Machine and Metals, Inc.*



35—Radial Blade Fan

Bulletin FD 205, 16 pages, describes the Type CR Fan—a radial blade type for industrial and power plant service, for induced draft applications where abrasion is present. Performance characteristics are detailed and performance curves, dimensions, and specifications are given to aid in selection of the proper unit. *Buffalo Forge Co.*



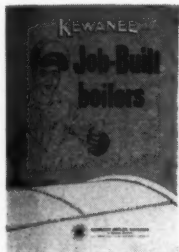
36—Fans

Catalog 221, 91 pages, presents comprehensive data on Clarage Type NH fans. Information is conveniently arranged to enable engineers, designers, and architects to select readily the proper fan equipment to meet specific air handling and conditioning requirements. Charts, tables, and graphs are included. *Clarage Fan Co.*



37—Air Distribution

Catalog F 7912 describes and illustrates the Uni-Flo Airturn, a factory-fabricated, ready-to-install air turning device designed to give sweeping radius performance to the square duct corner. Bulletin includes pressure loss data to enable you to determine the true elbow losses throughout the air distribution system. *Barber-Colman Co.*



38—Commercial Boilers

"Job-Built Boilers," four-page catalog 511, illustrates and describes Kewanee's Scotch and Firebox Type Boilers which can be moved into existing boiler rooms through available doors and passageways. These commercial size boilers are delivered in sections and then assembled—for schools, hotels, etc. *Kewanee Boiler Div. of American Standard.*



39—Packaged Chillers

Two series of Acme Flow-Therm Packaged Liquid Chillers—"C" Series complete with compressor, capacities 20 to 175 tons and the "R" Series for remote compressor mounting, capacities 15 to 300 tons—are described in 16-page catalog 220-B. It includes pressure drop data, mechanical specifications, and selection procedure. *Acme Industries, Inc.*



40—Boiler-Room Layouts

Four-page folder AD-137 suggests boiler-room layouts and gives dimensions and specifications for both the LR (125-600 hp) and new CB (15-100 hp) self-contained boilers. Illustrations stress compactness of design and advantages of use for high pressure and low pressure steam or hot water heating or processing. *Cleaver-Brooks Co.*



41—Roof Ventilators

Penn Ventilator's complete line of powered and gravity roof ventilators and accessory products is shown in new eight-page bulletin NHS-57. It includes performance tables, dimensional charts, specifications, and construction details for over 15 different units for public, commercial, and industrial buildings. *Penn Ventilator Co.*



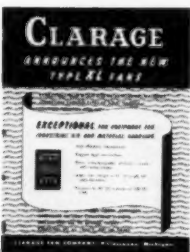
42—Airfoil Centrifugal Fans

Airfoil centrifugal fans for heavy duty industrial applications, available with single and double inlet construction in sizes for volumes up to 1,000,000 cfm, are suggested for use in power plants, refineries, steel mills, and vehicular tunnels in eight-page bulletin 4824. Four different types of controls are discussed. *American Blower Corp.*



43—Commercial Boilers

The new Progress Commercial Heating Boilers, industrial-type-quality, packaged boilers for commercial steam and hot water applications, are described and illustrated in four-page bulletin AD-157. Drawings and specifications are given to help in planning and making a layout of your client's boiler installation. *Cleaver-Brooks Co.*



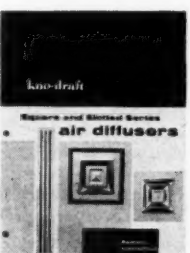
44—Industrial Fans

The new line of Clarage Type XL Fans is described in bulletin 702, four pages. It points out the high efficiency, great adaptability, and extra-rugged construction that make these fans suitable for industrial air and material handling. Sizes are from 11 to 60 in. diameters, pressures to 18 in. SP, and volumes to 130,000 cfm. *Clarage Fan Co.*



45—Packaged Generator

Eight-page bulletin 508 shows typical Johnston boiler installations with descriptions outlining the many Johnston features. Boilers are available in a range of sizes from 75 to 750 hp, self contained, fire tested, and ready for operations. Bulletins that contain data on other types of boilers are listed. *Johnston Brothers, Inc.*



46—Air Diffusers

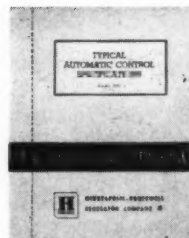
Twelve-page bulletin K-27 introduces the Kno-Draft "Architects' Group" of air diffusers available in two basic types; the Square Diffuser in three models, and the Slotted Diffuser in two models. Typical installations are shown, and tables and selection and performance charts are presented for each model. *Connor Engineering Corp.*

To order personal copies of these bulletins, please fill out the card between pages 4 and 5 or 24 and 25.



47—Electronic Control Center

The Supervisory DataCenter, an installation that collects, at a central location, key operating data of an air-conditioning system, and incorporates remote control devices to supervise the system's operation, is described in 18-page brochure TD-111. It discusses resulting reduced cost of operation. *Minneapolis-Honeywell Regulator Co.*



48—Automatic Control Specs

Eight-page technical data brochure TD-1050 includes sample electronic, electric, and pneumatic specifications arranged so that specs for the Supervisory Data Center (See bul. #47, at left) can be prepared with minimum effort. Scope, control equipment, and installation data are given. *Minneapolis-Honeywell Regulator Co.*

ELECTRICAL EQUIPMENT



49—Lighting Layouts

This 60-page catalog on Built-in Lighting gives complete details and layout data, including illustrations of installations. Efficiencies and distribution curves for both incandescent and fluorescent recessed lighting fixtures are included. The 62 types of lenses and special features available are described. *The Kirlin Company.*



54—Air Circuit Breakers

Bulletin GEA-5915, 16 pages, describes the AK line of magnetic air circuit breakers for low-voltage (600 v and below) applications. It includes application information for applying breakers individually or in selective or cascade systems. Dimensions and specifications cover indoor and outdoor use. *General Electric Co.*



50—Transformers and Substations

Twelve-page bulletin 655 describes construction and advantages of the Sorgel Load Center dry-type and Askarel-cooled transformers — units that can be installed in buildings without fireproof vaults. Substations embodying these transformers and supplied with various types of primary and secondary switchgear are discussed. *Sorgel Electric Co.*



55—Interlocked-Armor Cable

A complete line of Anaconda DURA-LOX Interlocked-Armor Cables is described and illustrated in 16-page brochure DM-5605. Included is information relating to applications, advantages, and construction features; installation, terminating, and jointing methods. Use by utilities and industry is shown. *Anaconda Wire & Cable Co.*



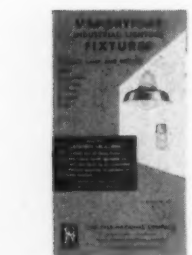
51—Instrument Tubing Trough

Twelve-page bulletin 255 describes the Instrof system, a new standardized trough design, for the support of instrument tubing. Wide range of fittings that makes possible rapid assembly at the job site is shown, with special attention given to the built-in coupler. Booklet points out advantages of continuous support. *T. J. Cope, Inc.*



56—Cable and Tube Raceways

The Globetray system of cable and tube raceways engineered for uniform design and easy installation is described in this 12-page bulletin. Aluminum and steel load data are given along with illustrations of expanded metal, solid bottom, and standard types of Globetray raceways. Installation photos are included. *Globe Co.*



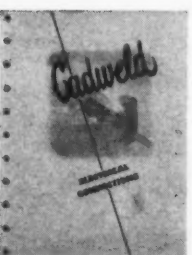
52—Industrial Lighting

How Vaportight industrial lighting fixtures protect lamp and wiring is explained in bulletin 635. Pendant, surface mounted, and outlet box fixtures are described and illustrated. NEC permits use in locations where easily ignitable particles are not likely to be suspended in sufficient quantity to produce an ignitable mixture. *The Pyle-National Co.*



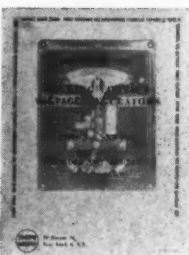
57—Pushbutton Guide

Bulletin B-6749 is a complete 76-page guide containing illustrations, application data, dimensions, and prices of a complete line of Industrial Pushbuttons. Whether the application calls for standard duty, heavy duty, Oil-tite, or special service control stations, this easy-to-read catalog will give the answer. *Westinghouse Electric Corp.*



53—Electrical Connections

Cadweld process described in 76-page electrical connection catalog is a method of welding copper to copper or steel without an outside source of heat. Equipment to form many types of electrical connections is described. Types of connections include cable, ground rod, horizontal and vertical surface, rail bonds, and studs. *Erico Products, Inc.*



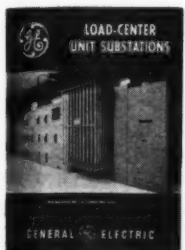
58—Voltage Regulators

Types JS1/1 and JSG1/1 rocking contact voltage regulators for small and medium-sized a-c generators are described in 14-page bulletin P 08-3090. Connection diagram, outline and mounting drawing, and application chart are given. The booklet is indexed for easy reference and carries complete specifications. *Brown Boveri Corp.*



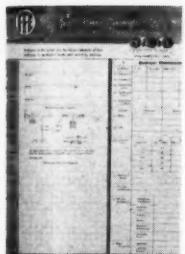
59—Cable Trough

Sixteen-page bulletin 67A gives full details on the new 70,000 Series prefabricated, expanded metal trough with built-in coupler for supporting power cable in less space and at less cost than conduit. Tracing templates are reproduced to exact scale for your convenience in detailing the most widely used Cope trough items. *T. J. Cope, Inc.*



60—Load-Center Distribution

Bulletin GEA-3592, 32 pages, describes advantages of using load-center distribution and compares various load-center systems. It includes complete descriptions of incoming-line equipment, transformers, and low-voltage switchgear. Tables give ratings, weights, dimensions, and application information. *General Electric Co.*



61—Planning Guide

Eight-page bulletin 10004-B gives complete information on how to plan and specify isolated phase bus for generator leads and switching stations. It contains the latest data on the new telescoping cover construction. This is a companion bulletin to comprehensive 28-page bulletin 1000-A on metal-enclosed bus. *I-T-E Circuit Breaker Co.*



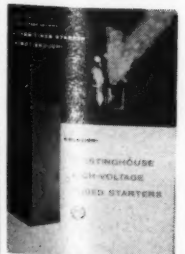
62—Junction Boxes

Pylet junction boxes for heavy duty use, with weather-tight, gasketed covers, of ferrous alloy, rust proofed, to drill and tap in the field, or factory tapped as specified, are detailed in bulletin 633. Use for wiring pulling, splicing, terminal blocks, and as housing for electrical devices is discussed. *The Pyle-National Co.*



63—Dry Type Transformers

Six-page bulletin HD 499 contains descriptions, specifications, and photos of Hevi-Duty's complete line of dry type transformers for power and lighting circuits, electric furnace control, phase changing, indoor sub-stations, machine control circuits, motor starters, and other similar types of specialty uses. *Hevi-Duty Electric Co.*



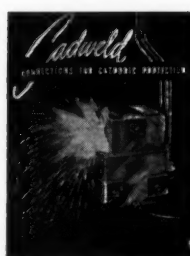
64—Fused Starters

"For industrial high-voltage systems a 'ten times starter' is not enough," according to 12-page booklet B-6535. It tells how high-voltage, fused starters give protection to the system, personnel, and motors. Horsepower ratings and representative types of starters available for a-c motors are listed. *Westinghouse Electric Corp.*



65—Fluorescent Lighting

Bulletin b, 36 pages, contains descriptions, illustrations, and lighting data on 394 Benjamin industrial fluorescent lighting units. It includes such advanced equipment as 25 percent Upward Light units and systems utilizing the new higher-output 800 ma. fluorescent lamps. Coefficients of utilization are given. *Benjamin Electric Mfg. Co.*



66—Cathodic Protection

Cadweld connections for cathodic protection are described in four-page folder 549-2. Included are specification tables, drawings, and directions for ordering and installation of formed terminal connections and anode lead connections. How copper is welded to either copper or steel without heat is explained. *Erico Products, Inc.*



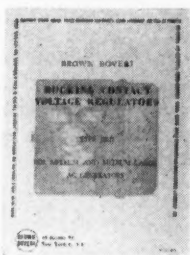
67—High Voltage Insulation

Exceptional characteristics of Anaconda Type AB butyl-rubber insulation in high-voltage applications are highlighted in engineering bulletin EB-27, 12 pages. It details results of tests in which Type AB compound demonstrated unusual ozone resistance, long aging performance, and good power factor stability. *Anaconda Wire & Cable Co.*



68—Bus Duct Manual

"Bus Duct Manual," 72-page bulletin B-4272B, is designed for consultants' use in planning and selection of units for bus duct layout in commercial, institutional, and industrial buildings. Plug-in duct, weather-proof feeder duct, low-impedance duct, and weather-proof low-impedance duct are fully covered. *Westinghouse Electric Corp.*



69—Generator Voltage Control

Rocking contact voltage regulators, Type JB1/1, for medium and medium-large a-c generators are described in 12-page booklet P 08-3095. Specifications and special features, theory of operation, sensitivity, application, parallel operation, and, compounding are discussed and outline and mounting diagrams given. *Brown Boveri Corp.*



70—Low Voltage Switchgear

Bulletin 6004-B, 12 pages, describes I-T-E low voltage metal-enclosed drawout switchgear, indoor and outdoor, incorporating type K and LG circuit breakers. Ratings are through 600 v, 6000 amp continuous, and 150,000 amp interrupting. Also included are basic standard arrangements. *I-T-E Circuit Breaker Co., Switchgear Div.*



71—Motor Selector

"Reliance Motor Selector," 12-page bulletin B-2103-1, is a working tool for engineers specifying a-c motors, for general or special services. It lists speed-frequency relationship, explains design classes, lists current and torque values and frame sizes, and gives suggested applications for each motor type. *Reliance Electric and Engineering Co.*



72—Pan and Tilt Units

Features, application, and descriptive information on Model PD-124 Remote Pan and Tilt unit, indoor type, for the GPL Vidicon closed-circuit television camera are contained in this catalog sheet. Included are photos and descriptions on the Type A and Type B remote control boxes with specifications. *General Precision Laboratory, Inc.*



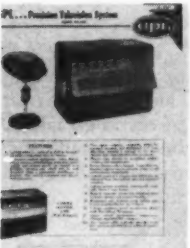
73—Motor Engineering Data

Consultants concerned with selection of motors and generators for industrial applications will find a wealth of useful engineering information in 60-page book 51R7933. Covering the entire range of motors and generators, it is not a text book but rather an outline of useful engineering information for reference use. *Allis-Chalmers Mfg. Co.*



74—High Speed Circuit Breakers

Six-page bulletin 3004-A contains descriptive and technical information about the FB line of high speed, current limiting d-c circuit breakers. Principle applications of these breakers are for generators, motors, anode protection, and as feeder breakers. Wiring diagrams and outline drawings are included. *I-T-E Circuit Breaker Co.*



75—Television System

Outstanding features of the Model PD-150 Precision Television System are listed in this catalog sheet. Complete descriptions and specifications are given for the standard GPL Vidicon closed-circuit TV camera and both portable and wall mounted camera control units. Equipment supplied is outlined. *General Precision Laboratory, Inc.*



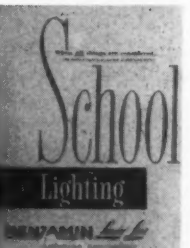
76—Corrosion-Proof Motors

"Corrosion-Proof, From Core to Cover," eight-page bulletin B-2406, outlines the special construction features of Reliance Electric corrosion-proof motors, 1 through 150 hp, 2 or 3 phase, 60 cycle, 220 through 2300 v. Protection of all internal mechanical and electrical parts is pointed out by means of drawings. *Reliance Electric and Engineering Co.*



77—Disconnectors

Bulletin 140, 36 pages, describes 3E ISOLATORS for disconnecting equipment and cables, in ratings up to 15,000 v and 1200 amp. It lists points to be considered when ordering, shows the units in typical applications, and gives dimensional drawings, cutaways, and specifications for the various types. *Electrical Engineers Equipment Co.*



78—School Lighting

"School Lighting," four-page folder AD 6549, lists the factors to consider when selecting lighting units for schools. These include: light levels, visual comfort, vertical surfaces, corridors with lockers, environmental lighting, and maintenance factor. Lighting fixtures for various uses are illustrated. *Benjamin Electric Mfg. Co.*



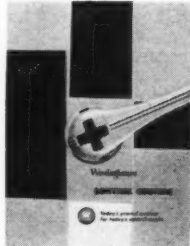
79—Air Interrupter Switch

Full details on the new High Voltage Air Interrupter Switch are given in eight-page bulletin 100. Included are descriptions, case and cutaway photographs, multiple position illustrations, dimensional drawings, typical specifications, and examples of built-in installations. Ratings 600 amp at 15 kv. *Continental Electric Equipment Co.*



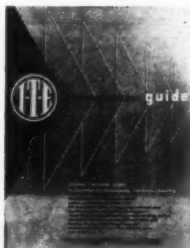
80—Large Air Circuit Breakers

Six-page bulletin 1004-A describes the I-T-E K Line circuit breakers. It includes manually and electrically operated circuit breakers to be applied as switchboard breakers, individually enclosed breakers (Urelites), and one-high individually enclosed drawout units. Data is given on heavy duty d-c breakers. *I-T-E Circuit Breaker Co.*



81—Control Centers

"Westinghouse Control Centers," 32-page bulletin, analyzes advantages gained with control centers in small shops with a few motors, office buildings, stores, power plants, and in large industries. Charts and tables are included to help you select the proper control center arrangement for the job. *Westinghouse Electric Corp.*



82—Products Guide

This 16-page bulletin contains descriptive data on major products manufactured by I-T-E, such as: power switching equipment, metal-enclosed bus, metal-clad and low voltage metal-enclosed switchgear, unit substations, air circuit breakers, network analyzers, mechanical rectifiers, and porcelain insulators. *I-T-E Circuit Breaker Co.*



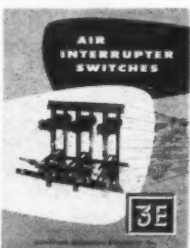
83—Dry-Type Transformers

"Latest Development in Dry-Type Transformers," eight-page bulletin 155, gives typical applications, sizes and types, construction, and specifications for air-cooled, dry-type transformers, both standard and custom-built. Photos and short descriptions are included for many of the types of transformers and accessories. *Sorgel Electric Co.*



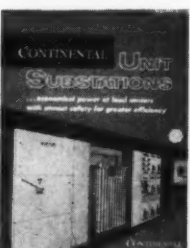
84—Transformer Manufacture

Four-page folder 55-VMT is a visual picture of a visit to the Marcus transformer plant. You are shown through the engineering, production, and shipping departments to point out the care with which each order is checked and carried out. This company makes a complete line of dry type and liquid-filled transformers. *Marcus Transformer Co.*



85—Air Interrupter Switches

Bulletin 152 lists and illustrates a complete line of dry-type and liquid-filled Switches through 14.4 kv. Units offer Auto-Speed interruption and automatically produced interruption that occur at the same point in the switching operation and take 1/2 cycle. Ratings, dimensions, and specifications are given. *Electrical Engineers Equipment Co.*



86—Unit Substations

"Continental Unit Substations," 16-page bulletin 102, explains how compact, enclosureless packaged power at load centers effects installation and operating economies, while stepping up production and providing for future load demands. Dimensions, weights, operating data, and specifications are given. *Continental Electric Equipment Co.*

VEMCO Drawing Instruments



87—Drawing Instruments

The complete line of VEMCO drawing instruments of lightweight, all steel construction, designed to meet the heavy duty demands of modern pencil drawing techniques, is featured in this catalog. Included are descriptions of standard compasses, beam compasses, dividers, and VEMCO drawing sets. *V. & E. Manufacturing Co.*

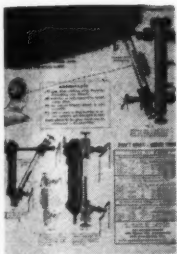
VEMCO



88—Drafting Machines

Four-page brochure DM-2 on VEMCO drafting machines describes the standard machine and the specialized civil engineer's machine. The latter is designed for extreme accuracy in making maps, and enables the engineer to plot any type of surveying data directly from field notes. Information is given on scales. *V. & E. Manufacturing Co.*

INSTRUMENTS AND CONTROLS



89—Water Gages

Split-gland adjustable water gages for boilers, heaters, tanks, and similar equipment are described and illustrated in two-page bulletin 9-9-54. Designed to be attached to any make water column or boiler, the units can be set vertically or inclined. Table gives recommended maximum working pressures. *Ernst Water Column & Gage Co.*



94—Remote Reading Gages

"You Can Check the Liquid Level From Anywhere in the Room," eight-page bulletin 246, covers the three standard types of Convex Scale and Flat Scale Truscale Remote Reading Gages, showing how they afford protection for valuable equipment and thus prevent expensive and time consuming shutdowns. *Jerguson Gage & Valve Co.*



90—Combustion Control Systems

Bulletin MSA-116, 16 pages, describes, and illustrates with schematic drawings, combustion control systems for six different types of gas fired boilers. Descriptions and schematics are also included for three-element boiler drum lever control and Hagan remote switching. Typical installation photos are shown. *Hagan Corp.*



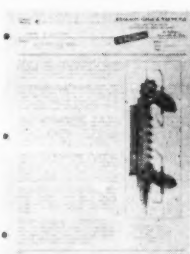
95—Safety Devices

Water columns, gages, valves, and other boiler safety devices are described in catalog 500, "Boiler Water Columns and Gage Equipment," available to consulting engineers. Many new designs are described completely with photographs, cross sections, and mechanical drawings. Specification and dimensions given. *The Reliance Gauge Column Co.*



91—Liquid Level Indicators

How the Eye-Hye gage helps protect the power plant from liquid level accidents is explained in four-page catalog 500, Sec. CO. A diagram shows the flexibility of placement possible: near boiler, tank, or other vessel, or on instrument panelboard, near by or considerably removed from the boiler. *The Reliance Gauge Column Co.*



96—Electrically Heated Gage

The new Jerguson electrically heated gages and valves, designed for installations where accurate gaging requires heating but no steam is available or carrying steam to the site is impractical, are described in data sheet 237. Types of electrical controls, variety of designs, and construction are discussed. *Jerguson Gage & Valve Co.*



92—Liquid Level Gages

Liquid level gages of bronze, forged steel, and all iron, for all pressures and temperatures, are described in four-page bulletin 11-1-52. Also shown are flow indicators that may be installed in vertical or horizontal position, illuminators, leakless try cocks, warning whistles, and other specialties. *Ernst Water Column & Gage Co.*



97—Liquid Level Indicators

Twenty-page bulletin 1824 describes remote liquid level indicators for boilers, heaters, storage tanks, and other vessels in power and industrial process plants. It shows 17 hook-up diagrams, remote signal alarms, and electric secondary indicators, temperature compensators, and wiring diagrams, plus 27 typical installations. *Yarnall-Waring Co.*



93—Automatic Controls

An enormous volume of valuable material, well illustrated, is to be found in the large, 52-page catalog 700B, "Mercoid Automatic Controls for Domestic and Industrial Applications." All types of controls manufactured by this company are described in detail so that the right specifications can be written to fit the job. *The Mercoid Corp.*



98—Test Gage Catalog

Eight-page bulletin 400 deals with selection of test gages for fluid pressure measurement in laboratories, production testing, field inspections, test stands, and recalibration benches. It provides a list of check points for ordering gages, and suggests applications for each. *U. S. Gauge, Div. of American Machine and Metals, Inc.*

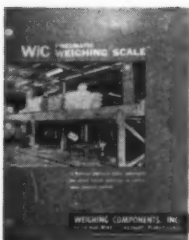


99—Process Control Instruments

Catalog 505, 16 pages, on pneumatic instruments for process control, discusses indicating pilots, transmitters, and receiver gages. The new 3½ in. Scanning Diaphragm Receiving Gauge with rotatable dial is described and illustrated. Ordering data, dimensions, and typical dial faces are given. *U. S. Gauge, Div. of American Machine and Metals, Inc.*

To order personal copies of these bulletins, please fill out the card between pages 4 and 5 or 24 and 25.

MATERIALS HANDLING AND STORAGE



100—Weighing Scales

"W/C Pneumatic Weighing Scale," four-page folder 10, describes a new platform weighing scale adaptable for batch or continuous process control, with scale indication errors never greater than 0.25 percent of range. Bulletin covers outstanding features, typical applications, accessories, capacities, and sizes. *Weighing Components, Inc.*



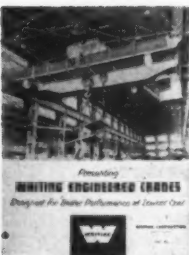
101—Industrial Storage Silos

"Modern Industrial Storage Systems," 12-page brochure 4393, discusses the subject of storage for raw ingredients, semi-processed, or finished material. The flexibility and adaptability of concrete silos is discussed. Descriptions of component parts and construction are supplemented with line drawings. *The Marietta Concrete Corp.*



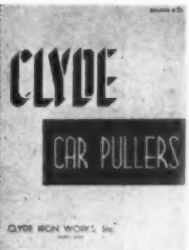
102—Conveyor Scales

"Weight at a Glance," 22-page bulletin 375, contains complete specifications, drawings, and illustrations of the Merrick Model E Weightometer—a fully automatic conveyor scale for continuous weighing of material passing over an existing belt conveyor. Other types of automatic weighing machines are described. *Merrick Scale Mfg. Co.*



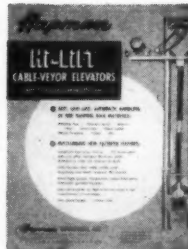
103—Cranes

Twelve-page catalog 80 explains how your client gets low cost handling with Whiting engineered cranes. Such features as Selectodyne control, full vision cab, and Timken tapered roller bearings are described. Photos show the cranes in use in foundry yards, in steel mills, in diesel repair shop, and in power plants. *Whiting Corp.*



104—Car Pullers

Ten-page bulletin L-6 shows capstan type car puller for moving cars a short distance using manila rope. Three styles of drum car pullers for heavy duty car moving, shuttle work, or for servicing very large areas are also listed, as well as barge movers for shifting barges back and forth during unloading. *Clyde Iron Works, Inc.*



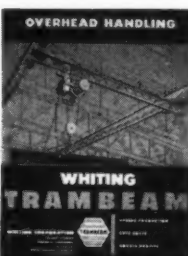
105—Materials Elevator

A completely new Hi-Lift Cable-veyor Elevator that offers savings on many applications is described in four-page bulletin H-556. Tables of capacities, sizes, and dimensions, and dimensional drawings assist in selection of the elevator head design to suit your application. *Hapman Conveyors, Inc., Div. Hapman-Dutton Co.*



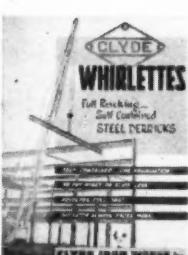
106—Automatic Feeders

Bulletin 253, 16 pages, discusses the application of the Merrick Model WS Feedoweight—a self-contained automatic, continuous gravimetric feeder for blending, proportioning, or feeding of granular materials to process by weight. Specifications, drawings, and capacities are given for left and right-hand assembly. *Merrick Scale Mfg. Co.*



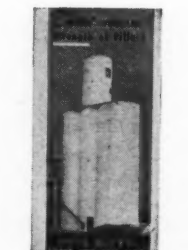
107—Overhead Handling Systems

Trambeam, an overhead handling system available in either monorail or crane systems and designed to handle loads up to 15 tons, is described in 20-page bulletin M-20. Motor-driven, electric hoist, and cab-operated carriers are shown. Special features such as the flexible suspension are discussed and pictured. *Whiting Corp.*



108—Steel Derricks

Advantages gained by using Whirllettes—full revolving, self contained steel derricks—are listed in four-page folder MP-49. The hoist is mounted on the rotating structure and only one foundation is necessary. No guy lines or stiff legs are required. Booklet gives specifications, and illustrates typical uses. *Clyde Iron Works, Inc.*



109—Storage Bins

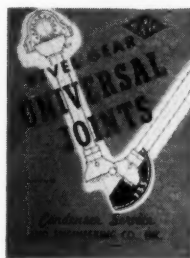
If you specify vertical storage construction for handling flowable bulk materials, this ten-page fold-out will help you visualize how this company's Super-Concrete Stave Storage Bins might meet your requirements. The booklet contains photographs of typical installations, lists uses, and explains construction. *The Neff & Fry Co.*

MECHANICAL POWER TRANSMISSION



110—Turbine Pump Drives

Right angle turbine pump drives, in standard and combination drive installations and available in a wide range of models to meet specific requirements of high or slow speed prime movers and pumps, are described and illustrated in nine-page catalog 27. Tables and charts show power ratings and average efficiencies. *Johnson Gear & Mfg. Co.*



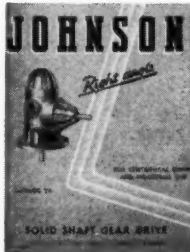
114—Universal Joints

CONSECO Bevel Gear Universal Joints are designed to give perfect remote control of inaccessible valves, pumps, engines, antennae, ventilators, and turrets, according to eight-page bulletin CS-10. Construction, materials, capacity (from 1580 to 4938 in. lb. at 49 rpm), and applications are described. *Condenser Service and Engineering Co. Inc.*



111—Power Transmission

"Power Thrifty Products by Phillie Gear," eight-page catalog, presents the wide range of unit types and sizes of geared power transmission equipment offered by Philadelphia Gear: reducers, LimiTorque, fluid mixers, industrial gears, and mechanical couplings. Typical applications for each type are listed. *Philadelphia Gear Works, Inc.*



115—Right Angle Gear Drives

Right angle solid shaft gear drives, for centrifugal pumps and industrial use — cooling tower installations, barge service, sewage disposal, fire and flood control — manufactured in a wide range of models to meet specific requirements, are described and illustrated with engineering details in eight-page catalog 28. *Johnson Gear & Mfg. Co.*



112—Flexible Gear Couplings

Advantages and typical applications of flexible gear couplings are pictured and described in 16-page catalog C-4, "The Revolutionary New Sier-Bath Flexible Gear Couplings." Couplings are available in standard, vertical, mill-motor, floating shaft and spacer type, and in many special purpose types. *Sier-Bath Gear & Pump Co., Inc.*



116—Gear Motors

Bulletin GM-560, 44 pages, is a complete, illustrated manual covering the design and selection of GearMotoRs, Utility GearMotoRs, In-Line Reducers, and Right Angle Motorized Worm Reducers. It lists standard unit specifications to facilitate application and briefly summarizes plant manufacturing facilities. *Philadelphia Gear Works, Inc.*



113—Clutches

The Electro Clutch, developed to connect or disconnect a driven shaft or gear from a driving shaft that is either running or standing still, is described in four-page bulletin ECP-656. Photos show the units in typical applications where many output speeds are desired. *I-T-E Circuit Breaker Co., Transformer-Rectifier Div.*

To order personal copies of these bulletins, please fill out the card between pages 4 and 5 or 24 and 25.

PIPING, VALVES, AND SPECIALTIES



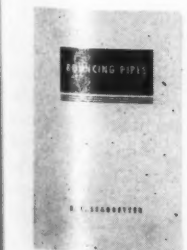
117—Conduit Systems

"Go Underground with Stillwater Conduit Systems," four-page illustrated brochure, describes tunnel and round ceramic conduit systems. It points up advantages of Stillwater Conduit Systems — permanence, protection, adaptability, ease of installation, and efficiency — in any combination of service piping. *Stillwater Clay Products Co., Conduit Div.*



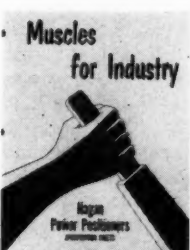
119—Pipe Fittings

General catalog 55, 304 pages, presents detailed dimensional data and specifications on a complete line of seamless welding fittings and forged fittings. It includes a 56-page technical data section featuring allowable stress and P/S tables and maximum working pressure charts. Catalog is tab indexed for quick reference. *Ladish Co.*



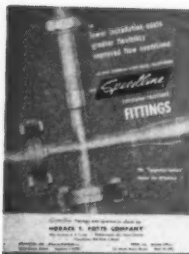
118—Pipe Vibration

The plague of oscillation set up in pipe lines during pumping of compressible gases is costing industry millions of dollars yearly through inefficiency and pipe system maintenance, according to booklet, "Bouncing Pipes," which deals in detail with the cause, effect, and remedy of this engineering problem. *Burgess-Manning Co., Snubber Div.*



120—Power Positioners

"Muscles for Industry" is a series of specification sheets covering all Hagan linear power operators from the 4 x 5 in. size up to 12 x 48 in. as well as diaphragm type operators. Complete information is given on each operator, including performance and construction specifications and dimensional diagrams. *Hagan Corp.*



121—Corrosion Resistant Fittings

This 22-page catalog explains how Speedline corrosion resistant fittings reduce piping costs by allowing the designer to take advantage of the new and more economical Schedules 5 and 10 stainless steel pipe. A schematic drawing illustrates use of these fittings for a wide range of industrial applications. *Horace T. Potts Co.*



122—Design Properties of Pipe

"Design Properties of Pipe," ten-page bulletin TT 330, presents in table form all the dimensional data needed to determine wall thicknesses required to resist internal pressure, bending stresses resulting from line expansion or caused by weight loadings, and column sizes required to sustain specified axial loads. *Tube Turns, Inc.*



123—Piping Insulation Manual

"Technical Data Manual," 20-page booklet, is designed to give engineers all available information on the application of Gilsulate, a new insulation for hot underground pipes. It describes the three grades, how to determine ditch size for various pipes and types of soil, and gives sample problems. *American Gilsonite Co.*



124—General Purpose Valves

New drop forged steel screw and socket weld end valves, in sizes 1/4 through 2 in., rated at 800 psi at 850 F and 2000 psi at 100 F, are described in 32-page "General Purpose Valves, Gate, Globe, and Angle Types." Pressure-temperature ratings, specifications, and dimensions are given for each type valve. *Henry Vogt Machine Co.*



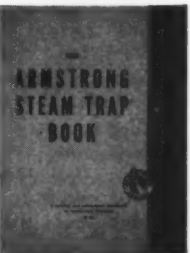
125—Underground Pipe Insulation

Four-page brochure L-102-F-56 discusses the problems of underground pipe insulation and explains how Gilsulate's special properties overcome them. On-the-job photos illustrate ease and speed of application. Thermal coefficients of transmission and other technical data and specifications are given. *American Gilsonite Co.*



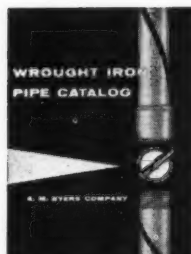
126—Surge Relief Valves

"Cushioned" Surge Relief Valves — their adaptability, adjustment, operation, servicing, patterns, and construction — are covered in eight-page bulletin W-2. For each type a cross sectional drawing, list of parts, list of materials, dimensions, specifications, and installation arrangements are given. *Golden-Anderson Valve Speciality Co.*



127—Steam Trap Manual

"The Armstrong Steam Trap Book, 2nd Edition," 46-page catalog J, explains the benefits of good trapping and how you can obtain them. A handbook section provides capacity charts and other data necessary to the correct trapping of all major classes of steam-heated equipment. Manual is completely indexed. *Armstrong Machine Works.*



128—Wrought Iron Pipes

"Wrought Iron Pipe Catalog," 48-pages, covers the complete line of wrought iron pipe and tubular products. It gives physical properties, specifications, and drawings for each type of product and suggests possible uses. A complete index, installation photos, and conversion tables make this handy reference material. *A. M. Byers Co.*



129—Insulated Piping

"Prefabricated Insulated Piping Systems," 24-page bulletin 56-1, shows typical uses for Hel-cor pipe units for underground or overhead pipe systems, and for Utilidor conduits for protection of underground utility services. Sample specifications are given, along with conduit sizing charts and trenching dimensions. *Ric-wiL, Inc.*



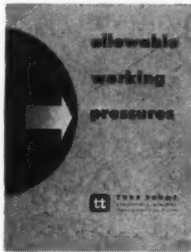
130—Pipe Insulation

Eight-page bulletin SO-1055 discusses the advantages of G-B Snap-On pipe insulation for low pressure steam and hot water, for service to 350 F, for dual temperature and cold piping, and for outdoor piping. It gives detailed application specifications for plumbing and heating and for insulation of valves. *Gustin-Bacon Mfg. Co.*



131—Check Valves

The electric double cushioned check valve is compared with the common check valve and the cone check valve in eight-page bulletin W-10. General dimensions, suggested wiring diagram, head loss graphs, specifications, and cross sectional views of both globe and angle body design valves are included. *Golden-Anderson Valve Speciality Co.*



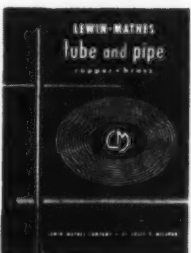
132—Working Pressures

"Allowable Working Pressures," 28-page bulletin TT 640, contains combination tables based on ASME Boiler Construction Code, 1952 Ed., and American Standard Code for Pressure Piping, ASA B 31.1 - 1955. Range of types and sizes of Tube Turn welding fittings and forged steel flanges are also given in table form. *Tube Turns, Inc.*



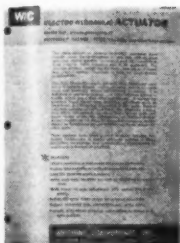
133—Washroom Equipment

Catalog 5601 includes complete information on Bradley Washfountains from the 54-in. full-circle model that accommodates up to 8 or 10 washers to the 2-person Duo-Washfountain with foot control of water supply and spray-head in place of faucets. Data on group showers and drinking fountains are included. *Bradley Washfountain Co.*



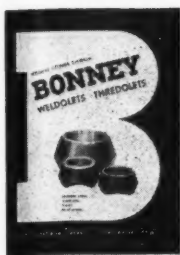
134—Tubing and Piping

This 12-page bulletin lists each type of Lewin-Mathes copper and brass tubing and piping with the temper, lengths, fittings, uses, and specifications. Sizes and capacities are in table form to aid in selection. Photos show use for water piping, air conditioning, heating, underground service and drainage lines. *Lewin-Mathes Co.*



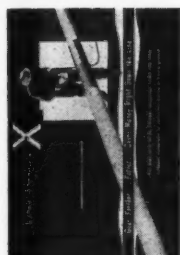
135—Actuators

Bulletin 22 describes a positional control for actuation of butterfly valves, control valves, and dampers. The actuator utilizes the electrical input signal from standard controllers and has linear stroke to 100,000 ft lb, full stroke in 1 sec, frequency response flat to 5 cps. Complete specifications are given. *Weighing Components, Inc.*



136—Fittings

This bulletin illustrates when and where to use Weldolets, Thredolets, and Socket Weldolets. Specific areas of application are shown with correct installation procedure. It describes the complete range of stainless, alloy, and non-ferrous fittings and Bonney's new marking standard. *Welding Fittings Div., Bonney Forge & Tool Works.*



137—Pipe Protection Tape

Tapecoat-X, the coal tar coating in tape form for single-wrap application, is described in this four-page bulletin. Illustrations and data point up economies in time, material, and labor resulting from extra thickness of coal tar available for protecting pipe, pipe joints, fittings, couplings, and tanks. *The Tapecoat Co.*



138—Gate Valves

"2 New Forged Steel Gate Lines," four-page bulletin 195-R, details the outstanding features of the 1100 Series Standard Flow and the 1300 Series High Flow valve. A trim chart and a pressure-temperature chart are given along with an exploded view of the valve, a table of general dimensions, and specifications. *The Ohio Injector Co.*



139—Power and Process Piping

"Harnessing the Energy of Steam" describes research, metallurgy, engineering, fabrication, and erection of high temperature, high pressure ferritic and austenitic alloy piping for central station, industrial, nuclear energy, and processing plants. Quality control and test methods are given. *Pittsburgh Piping and Equipment Co.*



140—Pressure Control Pilots

Bulletin 5303 on Leslie Pressure Control Pilots describes a simple mechanical device employing constant supply of clean air, gas, water, or light oil at 20-22 psi to produce a variable output or loading pressure of 0-20 psi in response to a level, pressure, or temperature change applied to operate a control valve. *Leslie Co.*



141—Lubricated Plug Valves

"Powell Lubricated Plug Valves," 36-page catalog PV-4, shows in detail the complete line of iron and steel lubricated plug valves available. Photos and sectional and detailed drawings are given for single, screwed, and bolted gland type valves. Also included are physical data on dimensions and ratings. *The Wm. Powell Co.*



142—Gate Valves

Bulletin 1007, four pages, describes and illustrates the versatility of the OIC Duo-Bolt Gate Line Valves in the IBBM and all iron series. The IBBM series features bronze seat rings that are cast and rolled into position. The all iron series features nickel plated steel stems and rugged resistant type body bonnet. *The Ohio Injector Co.*



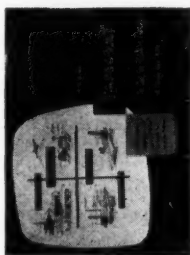
143—Diaphragm Valves

New 12-page catalog 100 describes Hills-McCanna diaphragm valves in terms of their advantages, applications, and specifications. The three basic types of valve operations are shown in cross sectional views, and dimensional specifications are given. Information is included on plastic bodies and diaphragms. *Hills-McCanna Co.*



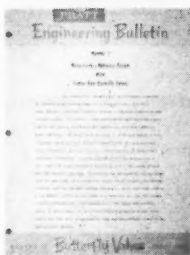
144—High Pressure Valves

The new Welbond Valves for high pressure, high temperature service are introduced in 12-page bulletin B-451. Temperature-pressure ratings, a selection chart, installation views, dimensions, and lists of materials are given. Valves are available in seven sizes from 1/2 to 2 1/2 in., for pressures 1500 to 2500 psi at 1050 F. *Yarnall-Waring Co.*



145—Pipe Protection

"Where to Use Tapecoat," eight-page bulletin, presents applications and data on Tapecoat coal tar coating in tape form for double-wrapping on pipe, pipe joints, mechanical couplings, conduit, cable and insulated piping, above and below ground. It includes table of coverage for various sizes and presents case histories. *The Tapecoat Co.*



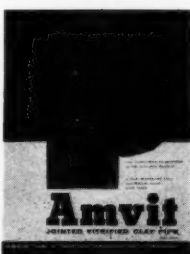
146—Modernizing Hydraulic Systems

"Modernizing Hydraulic Systems with Butterfly Valves," eight-page bulletin, details advantages of rubber seat butterfly valves to reduce leakage and for replacing worn valves. Diagrams show how narrow dimensions and use of slip joints or spool pieces make these convenient for modernizing water works or sewage systems. *The Henry Pratt Co.*



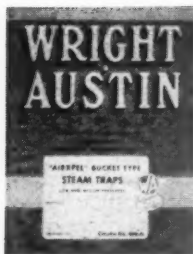
147—Drop Forged Fittings

The new drop forged Bonney Elbolets with full penetration weld are described in this catalog sheet. Applications for directional flow branches, Thermowell connections, and pipe support and hanger connections are discussed. These fittings are available from stock in carbon steel, stainless steel, and chrome moly. *Bonney Forge & Tool Works.*



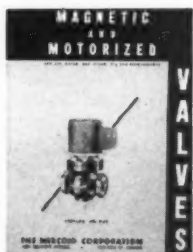
148—Jointed Clay Pipe

Jointed vitrified clay pipe known as Amvit, with a built-in mechanical joint made from polyvinyl chloride is described in four-page folder. Advantages such as infiltration prevention, quick installation, immediate backfilling, better flow, shock absorption, and quick testing in the field are pointed out. *American Vitrified Products Co.*



149—Bucket Steam Traps

Airpel bucket steam traps for low and medium pressures are described and illustrated in four-page bulletin 606-B. Ease of installation, interchangeability of valves and seats, accessibility, water seal, construction, dimensions, and materials are discussed. A capacity-orifice chart for Wright-Austin traps is given. *Wright-Austin Co.*



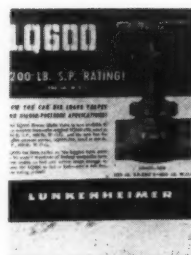
150—Valves

Twenty-page catalog V-55 covers magnetic and motorized valves for air, water, gas, steam, oil and refrigerants. It includes specifications, sizes, capacities, and suggested applications for each type of valve, flow charts for liquids and compressible fluids, tables of dimensions, and other engineering data. *The Mercoid Corp.*



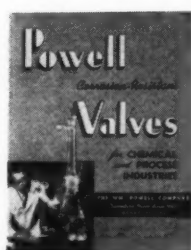
151—Reducing Valves

Four-page bulletin 561 describes the new "No Maintenance" steam pressure reducing valve for steam heat processes. Details of capacity regulation, construction, and new features are presented along with a complete list of applications, dimensions, and specifications. Saturated steam capacities are in table form. *Leslie Co.*



152—Bronze Globe Valves

This circular on the Fig. LQ600-200 Globe Valve points out that Lunkenheim LQ600 valves are now available in a new line for higher pressure service, rated at 200 lb S.P., 400 lb. W.O.G. It gives the dimensions of the eight sizes, from 1/4 through 2 in. in diameter, and describes design features and construction. *Lunkenheim Co.*



153—Corrosion-Resistant Valves

"Powell Corrosion-Resistant Valves for Chemical and Process Industries," form 166, gives features of construction, photographs, and sectional drawings of valves of every design, to meet almost every flow-control requirement. The large selection of metals and alloys in which they are available is listed also. *The Wm. Powell Co.*



154—PVC Valves and Fittings

Six page circular 601 describes Luncor all-molded, corrosion resistant PVC valves and fittings. It gives dimensions in inches and pipe fitting weights, lists chemicals resisted by PVC, and compares advantages and limitations of PVC with metal valves and fittings and tells which valves these can replace. *Lunkenheim Co.*

PLANT SITE SELECTION



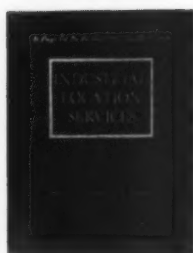
155—Plant Site—Marley Neck

"Where Can You Pick a Plant Site Plum Like This?" is a broadside describing the largest deepwater plant site on the Atlantic seaboard, Marley Neck, Port of Baltimore. The booklet includes colored maps and a comprehensive air view of some 4200 acres on Chesapeake Bay near the heart of the city. *Baltimore and Ohio Railroad.*



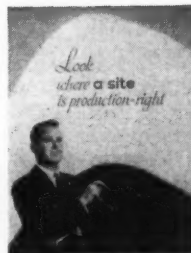
157—Colorado Site Facts

Documented facts about sites, power, labor, raw materials, markets, transportation, climate, taxes, and living conditions are contained in the booklet, "An Analysis of Industrial Colorado and Its Potential for Industrial Development." Booklet is in loose-leaf form so that it can be kept up to date easily. *Colorado Dept. of Development.*



156—Location Services

"Industrial Location Services," eight-page bulletin, is designed to acquaint you with the scope and character of this service offered by the New York State Department of Commerce. It discusses information available on raw materials, transportation, markets, labor, power and fuel, water, and sites. *New York State Dept. of Commerce.*



158—Plant Site Selection

"Look Where a Site is Production-Right," 24-page brochure, presents data useful to consultants and executives responsible for new plant location. Illustrated with colored maps, it describes power, fuel, labor, water, weather, key materials, transportation, and plant sites that offer best possibilities. *Baltimore and Ohio Railroad.*



159—New York State Map

"Physical Map of New York State and Adjacent Areas," full color wall map suitable for framing, 3 1/2 x 2 1/2 ft., gives major highways, single and multiple track railroads, short line rail distances between cities, and other data pertinent to questions your clients will ask about locating in New York State. *New York State Dept. of Commerce.*

To order personal copies of these bulletins, please fill out the card between pages 4 and 5 or 24 and 25.



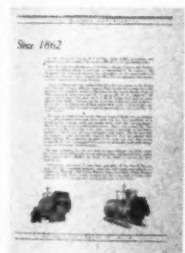
160—Burners

The Roto-Press burner described in eight-page booklet 9101 is designed to meet the demand for maximum steam, automatic firing, minimum floor space, and elimination of high stacks. How to convert your client's standard rotary burner to a Roto-Press is explained by means of text and pictures. *Products Division, Todd Shipyards Corp.*



161—Packaged Boilers

How Superior's four-pass boiler design lowers steam costs is explained in 20-page booklet. Rotary burner, gas burner, controls, and built-in induced draft feature are each described. Cutaway drawing shows path of combustion gases through the four passes. Data and dimensions are presented in table form. *Superior Combustion Industries, Inc.*



162—Boilers and Stokers

Complete descriptive and specification information on rugged Scotch boilers for gas, oil, and coal firing, and automatic underfeed stokers for Scotch type boilers, is given in 28-page bulletin 236. This well illustrated brochure includes test results, performance data, and complete details of design and construction. *The James Leffel & Co.*



163—Entrance Nozzles

Eight-page bulletin presents the M.I.T. laboratory report of tests made to determine the saving in fluid friction of the circulating water for a surface condenser after equipping the tubes with Flowrite entrance nozzles. Graphs show percent power saved, increased flow, savings in fluid inches of water. *Condenser Service and Engineering Co., Inc.*



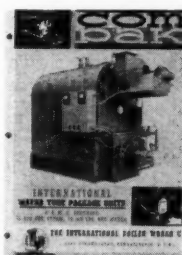
164—Power Equipment

The complete line of equipment produced by Cooper-Bessemer (compressors, pumps, engines) is detailed in eight-page bulletin. Features of each of the many products are summarized as to design and construction. Horsepowers, pressures, capacities, and other pertinent data are given with applications. *The Cooper-Bessemer Corp.*



165—Stationary Service Engines

Data sheet ES-D-22 gives information on a single model Enterprise engine for stationary service, to be operated as a diesel or dual fuel engine. Similar sheets cover engines with 73 to 7703 hp ratings. Complete specifications, standard and auxiliary equipment, design features, and ratings are given. *Enterprise Engine & Machinery Co.*



166—Convertible Package Boilers

Water tube package units that can be converted to coal firing during periods of oil or gas fuel shortages are described and illustrated in eight-page bulletin 600. Design and construction features, burner equipment for various fuels, standard and optional panel board equipment, and tests are discussed. *International Boiler Works Co.*



167—Package Steam Generators

Bulletin PSG-2, 10 pages, presents design and construction details, tables of capacities, dimensions, and weights of package unit type steam generators. Available in three standard pressures of 175, 250, and 375 psig, the boilers are designed to be used with many different types of firing and control equipment. *Henry Vogt Machine Co.*



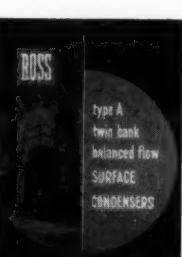
168—Condensate Return Systems

Schaub Condensate Return Units, which consist essentially of a motor driven pump and a receiver, and which are used to recover condensate from low pressure heating returns and boost it back to a centralized receiver, are described in four-page bulletin 655-C. Tables help you to select the right model. *Fred H. Schaub Engineering Co.*



169—Electric Plants

Catalog KEP56-1, 24 pages, shows the line of Kohler electric plants used as an independent source of electricity for sole supply and for automatic standby when central station power fails. Sizes range from 500 w to 50 kw, gasoline and diesel. Battery charging units in 6, 12, 36, and 140 v capacity are described. *Kohler Co.*



170—Surface Condensers

Twin Bank Balanced Flow design surface condensers—complete description, design details, exclusive features, and numerous photos of public utility and industrial power plant installations—are presented in 32-page bulletin 8.2K1. Details of Single Bank Balanced Flow design are in bulletin 8.1K1. *Ross Heat Exchanger Div. of American Standard.*



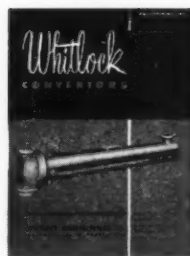
171—Wormfeed Stokers

Modern boiler room layouts and floor plans are provided in eight-page bulletin on the Duraflex Binfeed, a worm-feed stoker for industrial and commercial installations. Side ash dumps, extra grate area, and zoned windbox are a few of the features described. Available auxiliaries and accessories are listed. *Canton Stoker Corp.*



172—Integral-Furnace Boiler

Sixteen page bulletin G-83 describes the B&W Integral-Furnace Boiler, Type FP—a self-contained unit designed for power, process, or heating loads requiring steam capacities in the range of 30,000 to 80,000 lb per hr. The boiler is available for pressures between 160 and 800 psi in standard increments. *The Babcock & Wilcox Co.*



178—Converter Rating Tables

Bulletin 62, 16 pages, has been designed in answer to the need for converter rating tables that are accurate and arranged for rapid and easy reading. At least three Type R U-tube Converter sizes are listed for each set of operating conditions, depending on pressure drop limitations. Booklet is indexed for quick reference. *Whitlock Mfg. Co.*



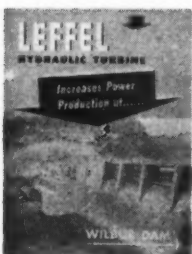
173—Water Tube Generators

Water tube Type D Superior steam generators with capacities up to 50,000 lb steam per hour are described in eight-page bulletin. With the literature comes a 12-page folder of specifications prepared to aid consulting engineers in selection, evaluation, and specification of water tube packaged units. *Superior Combustion Industries, Inc.*



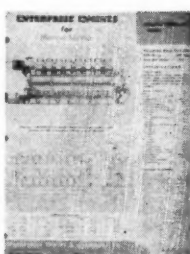
179—VP Package Boilers

Catalog P391, 16 pages, describes the new Type VP package boiler. Following a section of background information is an outline of principal design features. These boilers are shop assembled and provide steam capacities from 4000 to 42,000 lb per hr. Space requirements and specifications are in table form. *Combustion Engineering, Inc.*



174—Hydraulic Turbines

Details on Leffel turbine installation at TVA's Wilbur Dam are given in bulletin 1086. Other literature on hydraulic power includes bulletin 1095, "Philpott Dam Power Project"; bulletin 1098, "Chandler Power and Pumping Plant"; bulletin 1091, "Chatuge Dam Power Project"; bulletin 1094, "Nattley Dam Power Project." *The James Leffel & Co.*



180—Marine Service Engines

Data sheet EM-D18 gives specifications, dimensional drawings, standard and auxiliary equipment, design features, brake horsepower rating chart, tools, spare parts, and dimensional drawings for one model of Enterprise diesel engine for marine service. Similar sheets are available on 24 different sizes. *Enterprise Engine & Machinery Co.*



175—Spiral-wound Gaskets

General catalog, 28 pages, tells about the development of the original spiral-wound gasket and its present applications in aviation, atomic research, process industries, power plants, and ships of the Navy and Merchant Marine. It also lists various metals and fillers used in the manufacture of these gaskets. *Flexitallic Gasket Co.*



181—Boiler Feed Systems

Catalog 55-B, 16 pages, covers condensation drainage and automatic boiler feed systems for every industrial and heating requirement — boiler return, Pre-Heat, heat reclaim and deaerating systems. General application and function of each type of system is described to help you select the right one. *Fred H. Schaub Engineering Co.*



176—Vertical Unit Boilers

More than 25 years of development, manufacturing, and application experience are reflected in the design of the Type VU-10 vertical-unit boiler described in 16-page bulletin VU-10-8. Advantages and design features are discussed. Possible installations are shown by photographs and cross sections. *Combustion Engineering, Inc.*



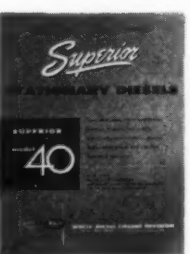
182—Diesel and Dual-Fuel Engines

A complete catalog containing 60 pages describes diesel and dual-fuel engines (including sewage gas engines) ranging from 100 to 2150 hp. Engines are available with speeds to suit a wide range of fixed or skid-mounted engine applications. Cross sections and graphs give engineering data. *White Diesel Engine Div., The White Motor Co.*



177—Reduce Steam Cost

"The Cyclone Furnace," 20-page bulletin G-65, tells how use of this type of equipment reduces cost of steam generation by reducing fly-ash emission, simplifies ash handling and disposal, eliminates need for pulverizers (furnace uses crushed coal), and reduces maintenance. Specifications are given. *The Babcock & Wilcox Co.*



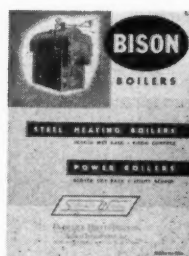
183—Diesel Engines

Superior Model 40 Diesel Engines from 215 to 1025 hp are covered in this bulletin. Heavy duty features such as fully-bedded crankshaft, individual cylinder heads and pumps, and full pressure lubrication with increased output in the same space as earlier models are pointed out and illustrated. *White Diesel Engine Div., The White Motor Co.*



184—Package Steam Generators

Seven-page bulletin AXY-1 gives full operating details and describes changes that have been made in the Amesteam generator, which is factory assembled, for 15 to 200 psi pressure. Units offer accessibility for inspection and maintenance, automatic snapswitch start, and automatic low water and flame protection. *Ames Iron Works, Inc.*



189—Boilers

Two types of Bison boilers—Scotch wet back steel heating boilers and Scotch dry back power boilers—are described in 12-page bulletin B-55. Ratings and dimensions and complete specifications are given for each model. Installation photographs show the boilers in use in various industries and commercial buildings. *Adsc Industries, Inc.*



185—Emergency Electric Power

"Power Points Digest, Vol. II, No. 3, 12 pages, is devoted to the application of Onan emergency generating plants in six different hospitals. Brief descriptions cover the electrical characteristics of each emergency unit and explain the typical installation features that assure the user reliable emergency power. *D. W. Onan & Sons, Inc.*



190—Lube Oil Purification

Turbine Lube Oil Purifiers being used in generating stations throughout the country are described in bulletin TL-103. It explains in detail how these centrifugals can protect your client's turbines against mechanical failures due to contaminated lube oil. Full specifications and dimensions are given for all models. *De Laval Separator Co.*



186—Condenser Expansion Joints

Discussion of expansion problems of turbine exhausts with special reference to modern, large or twin condensers is presented in this four-page bulletin. It shows construction of the Henry Pratt Rubber Belt Expansion Joint, and details advantages, such as simplified engineering of piping and temperature tolerance. *The Henry Pratt Co.*



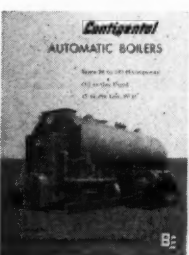
191—Emergency Service Plants

Vol. II, No. 1 of "Power Points Digest" is devoted to the application of Onan Electric Plants in emergency service. How Mercyville Sanitarium relies on a 35,000 w plant is described and illustrated along with examples of the units in use at a State Police station, in a hospital, in factories, and office buildings. *D. W. Onan & Sons, Inc.*



187—Heavy Duty Engines

"The W-9 Engine," four-page catalog S-500-B62, illustrates and describes construction features and gives ratings for six and eight cylinder engines operating at 900 and 1000 rpm. Included is a cutaway detail drawing of the Jet-Swirl design incorporated in the intake manifold. Specifications are given. *Worthington Corp.*



192—Fire-Tube Boilers

Continental Automatic Boilers—packaged, horizontal, fire-tube units for high or low pressure, oil, gas, or combination fired—are described in six-page bulletin BE3. Bulletin also enumerates the points to look for in selecting a packaged boiler. Cutaway shows details of design and construction. *Boiler Engineering & Supply Co., Inc.*

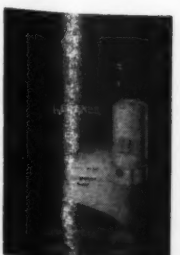


188—Spinning Gas Technique

The Continental boiler's spinning gas technique—a method of obtaining maximum heat transfer with simplified design—is presented in this four-page bulletin. Cutaway views and diagrammatic drawing illustrate air intake and flow of hot gases. Technique applies to boilers from 20 to 500 hp, 15 to 250 psi. *Boiler Engineering & Supply Co., Inc.*

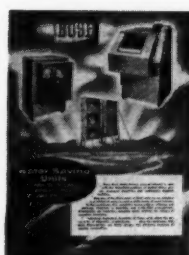
To order personal copies of these bulletins, please fill out the card between pages 4 and 5 or 24 and 25.

PROCESS EQUIPMENT



193—Water Heaters

Catalog 96, two pages, gives dimensions, ratings, and engineering data on the Tabasco Direct-Fired Water Heater for heavy duty use in restaurants, motels, hotels, hospitals, and barracks. Units are available for oil or gas firing, of welded construction, rated to heat 165 to 700 gal of water 50° per hr. *Kewanee Boiler Div. of American Standard.*



194—Water Saving Units

Bulletin 880, 16 pages, contains descriptive information, ratings, specifications, and selection data on Dunham-Bush Water Savers. Included are copper deck cooling towers and Inner-Fin evaporative condensers, constructed for use with either blower or propeller fan; and propeller fan condensers and pressure stabilizers. *Dunham-Bush, Inc.*



195—Convection Furnaces

Hevi-Duty Pit Type Convection Furnaces, used for heat treating operations that require temperatures from 250 to 1850 F, as in tempering, drawing, annealing, and hardening of steel, are detailed in eight-page bulletin 451. Typical uses and construction features are discussed and specifications are given. *Hevi-Duty Electric Co.*



196—Filter Cartridges

The HILCO filter cartridge type FTC made of Tufite, the new filter material with fine filtration, high flow rate and dirt storage, for lubricating, fuel, and industrial oil filtration, is described in bulletin F-152-2. Made to fit every size of HILCO filter, the filter cartridges have a steel center tube with fabric cover. *The Hilliard Corp.*



197—Corrosion-Proof Products

Sixteen-page bulletin CC-3 gives complete information on all of the services and products of this company, such as corrosion-proof cements, linings, coatings, rigid plastic fabrications, rigid plastic pipe and fittings, and pipe joint compounds. Also described are permanent corrosion resistant industrial floors. *Atlas Mineral Products Co.*



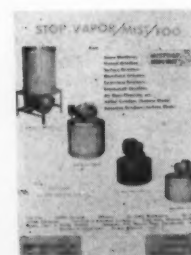
198—Vapor Condensers

Two-page bulletin 129-R explains operation of the Niagara Aero Vapor Condenser: evaporation of small quantity of water removes heat of condensation, providing higher vacuum than barometric condensers. Features include effective separation of non-condensibles, fully automatic operation, and low cooling water use. *Niagara Blower Co.*



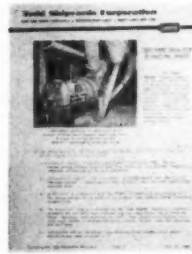
199—Silencers

Series ADS Acoustic Discharge Silencers, designed to eliminate both high and low frequency noises caused by high velocity steam and air discharged to the atmosphere, are described in four-page bulletin 265. Specifications are given for optimum silencing, standard silencing, and for heavy industrial areas. *Burgess-Manning Co.*



200—Vapor Collectors

Vapor, mist, and fog control bulletin 622-3 illustrates the complete line of Aget Mistkop Vapor Collectors and gives specifications on each model. Applications throughout industry are described in detail and illustrated. Ways in which Mistkops can improve production and cut down product rejects are shown. *Aget Mfg. Co.*



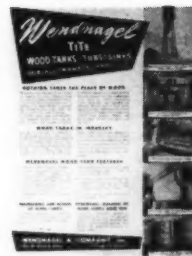
201—Air Heaters

"Todd-Thermo Direct Fired Air Heaters," two-page bulletin 184, describes details of combustion chamber for use in direct fired applications producing air temperatures of 200 to 2200 F, with a pressure range as required. Package design, accurate temperature control, and thermal efficiency are discussed. *Products Div., Todd Shipyards Corp.*



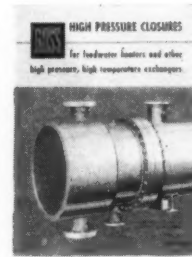
202—Gas and Air Compressors

Bulletin M-70, 40 pages, presents the M-Line Compressors for transmission of gas and air. Installation photos show these units in use on pipelines, in refineries and chemical plants, and used for air compression in industry. Cross sections and cutaways are included for many of the available types of compressors. *Cooper-Bessemer Corp.*



203—Wood Tanks

Wendnagel Tite wood tanks, tubs, and sinks for all types of industries are described in four-page bulletin 23. Suggested uses will give you an idea of how these products fit in with your clients' needs. Examples shown include tanks for sprinkler systems, processing, general water supply, and metal pickling. *Wendnagel & Co., Inc.*



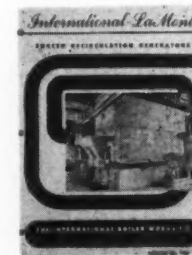
204—High Pressure Closures

Bulletin 5.6K1, four pages, describes high pressure closures for Ross feed-water heaters and other high pressure, high temperature exchangers. Design details are illustrated by photos and cross sections. Text discusses simplicity of design, safety factor, and ease of removal. *Ross Heat Exchanger Div. of American-Standard.*



205—Heat Exchangers

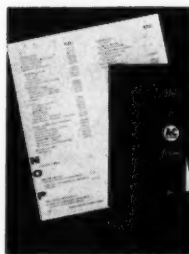
"Standard Heat Exchangers for Process Industries," 20-page bulletin M-306, spotlights the outstanding features of these units. Sizes and dimensions, surface areas, film coefficients, and characteristics of tubing are presented, along with a graph showing effect of fouling factors on over-all heat transfer rates. *The Lummus Co.*



206—High Temperature Water Heating

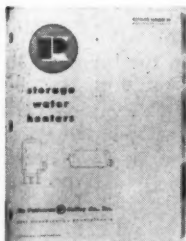
Basic advantages of the Type LFW Forced Recirculation Generators for high temperature water are given in ten-page bulletin 700. Chart compares capital investment, operating costs, and maintenance and repairs for high temperature water and high pressure steam for district heating from central heating plant. *International Boiler Works Co.*

To order personal copies of these bulletins, please fill out the card between pages 4 and 5 or 24 and 25.



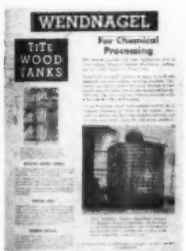
212—Bulletins Available

No other company makes the broad range of equipment manufactured by Allis-Chalmers, as pointed out in booklet 25B6057, "This is A-C from A to Z." It has been designed to acquaint you with this wide range of products and to serve as an alphabetical index to engineering literature available from A-C. Allis-Chalmers Mfg. Co.



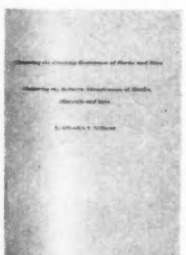
207—Storage Water Heaters

"Storage Water Heaters," 48-page catalog 19, gives construction details, storage and heating capacities, dimension tables, and standard specifications for steel, copper-lined, copper silicon, cement-lined, clad-galvanized, and Lo-Flo storage water heaters. Typical piping diagrams are included for easy reference. Patterson-Kelley Co., Inc.



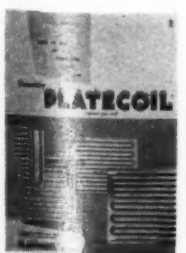
208—Chemical Processing Tanks

Typical Wendnagel wood tanks manufactured for use in chemical processing are shown in this two-page bulletin. Resistance to decay, acids, and chemicals, and superior insulating properties are pointed out. Types for fire protection, water storage, wine storage, and scrubbing towers are illustrated. Wendnagel & Co., Inc.



209—Crushing Resistance

"Measuring the Crushing Resistance of Rocks and Ores," 12-page booklet written by Benjamin B. Burbank, noted metallurgist, presents methods and equipment for measuring crushing resistance and abrasiveness of rocks, minerals, and ores. Detail sketches of testers are included. Pennsylvania Crusher Div. of Bath Iron Works Corp.



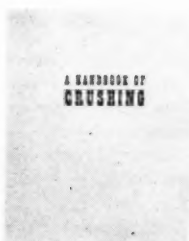
210—Heat Transfer Costs

"How to Cut Heat Transfer Costs," bulletin IP-356, features a detailed description of Tranter Platecoil construction, including specifications and dimensions. It lists and illustrates ten major advantages claimed for Platecoil and detailed sketches show 14 ways it has solved industrial heating problems. Platecoil Div., Tranter Mfg., Inc.



211—Heat Equipment

Specialized heat equipment, gas, oil, combination gas-oil burners, heat exchangers, air heaters, combustion and heat transfer equipment are all covered in eight-page bulletin 108. Many of the units are shown in photographs with an explanation of operation and maintenance for a particular application. Thermal Research & Engineering Corp.



213—Handbook of Crushing

"Handbook of Crushing," 40-page booklet, presents a wealth of data for any engineer faced with the problem of selecting the proper crusher for a certain job, or with analysis of a present installation. It gives details of selection, capacities, arrangements, types, and sizes. Pennsylvania Crusher Div. of Bath Iron Works Corp.



214—Oil Filters

The HILCO filtration systems for distillate and residual fuels are presented in four-page bulletin F-135 on the Hyflow Fuel Oil Filter. Important factors to consider in choosing the proper size filter are listed along with tables of specifications. Flow characteristics per cartridge are shown in graph form. The Hilliard Corp.



215—Air Preheater

How the Ljungstrom air preheater saves fuel, while improving performance of boilers, is told in 38-page bulletin. It gives structural details of the unit, points out ease of installation, how to modernize old installations, industrial uses, arrangements, specifications, and suggests typical additional uses. Air Preheater Corp.



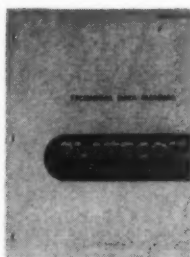
216—Fabrication

"Facilities and Products," 40-page brochure, tells how this company is now utilizing facilities developed during the war for producing peacetime products. Photos show production of such widely diversified products as paper-making machinery, hydraulic turbines, tanks, and pressure vessels. Newport News Shipbuilding and Dry Dock Co.



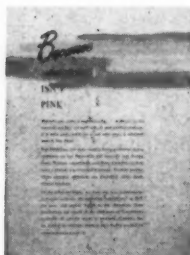
217—Storage Water Heaters

Adscos storage water heaters for use in buildings where large quantities of hot water are needed at irregular intervals are discussed in 16-page bulletin 54-75A. Directions are given for determining heater size. Conversion tables, lists of shell and head thickness, and piping diagrams are included. Adscos Industries, Inc.



218—Heat Transfer Manual

Technical Data Manual 514-C contains technical and engineering information concerning Tranter Platecoil heat transfer capacities and characteristics. Informative charts and tables based on research, experimentation, and field experience provide valuable short cuts in selection of heating and cooling systems. Platecoil Div., Tranter Mfg., Inc.



219—Humidity Control

Bulletin 222 is a 32-page manual covering many examples of increased operating efficiency due to humidity control. Equipment illustrated includes air conditioning type Lectordryers for maintaining lower humidities in rooms, high and low pressure air and gas dryers, breathers for storage tanks, and filters. Pittsburgh Lectordryer Corp.



220—Pre-Heated Air for Processing

"The Ljungstrom Air Preheater for Process Equipment," 12-page bulletin, explains how use of this unit can reduce fuel costs, replace expensive still convection surfaces, and improve product quality in petroleum refineries. It also describes how the unit operates and specific advantages of the design. Air Preheater Corp.



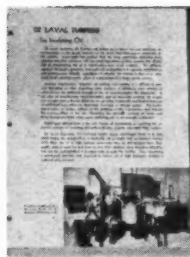
221—Tubular Filters

Tubular filters described in bulletin TS-160-755 provide maximum convenience for smaller filtration problems. Fluid moves through inside of tubes and out through perforated wall and filter paper. Filter is cleaned by replacing filter paper. Units cost less than scavenger plates used for large filters. Industrial Filter & Pump Co.



222—Pneumatic Equipment

Blowers, exhausters, pneumatic systems, Hoffco-Vac vacuum cleaners, Smooth-Flow tubular pipe and fittings, filters, flotation equipment, separators, and stills are described in four-page booklet M-133. It details their applications, operation, construction, and gives specifications. Industrial Div., U. S. Hoffman Machinery Corp.



223—Insulating Oil Purification

Bulletin TR1 describes how De Laval Insulating Oil Purifiers provide low cost insulating oil protection. These precision-made centrifugals remove water and foreign particles from insulating oils in a single pass without the use of filters. All models are listed with complete specifications given for each. De Laval Separator Co.



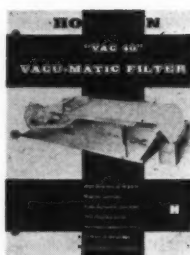
224—Mixer

"Simpson Mix-Mullers for the Ceramic Industry," four-page bulletin, outlines how this unit is used in the preparation of electronic porcelain, tile, structural clay and brick, refractories, whiteware, artware, dinnerware, and other ceramic bodies. Capacities, dimensions, and specifications on various models are listed. National Engineering Co.



225—Compressed Air Drying

Four-page bulletin 223B covers the Lectordryer equipment designed especially for handling compressed air, with particular reference to instrument air applications. It provides data on need for instrument air drying, moisture content of compressed air, and proper dewpoint and relative humidity. Pittsburgh Lectordryer Corp.



226—Vacuum Filter

Bulletin M-131 describes the Hoffman "Vac 40" filter, a completely re-designed, automatic, self cleaning unit for continuous filtration of grinder, hone, and other machine coolants. The filter medium, a special paper that is said to last five times longer than other paper filters, is discussed. Filtration Div., U. S. Hoffman Machinery Corp.



227—Low-Headroom Deaerators

Ten-page bulletin W-210-B33 illustrates construction features and gives complete specifications on horizontal and vertical models of Low-Headroom Deaerators. Included are engineering drawings, dimension and fitting tables, and ratings for deaerators with capacities from 17,500 to 80,000 lb per hr. Worthington Corp.

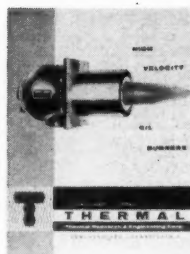


228—Water Heating Equipment

Catalog 5, 16 pages, contains tables of dimensions and capacities of storage water heaters, instantaneous heaters, convertors, and suction and discharge-side fuel oil heaters. Selection of equipment for any heating requirement may be made easily, with either steam or boiler water as the heating medium. Patterson-Kelley Co., Inc.

To order personal copies of these bulletins, please fill out the card between pages 4 and 5 or 24 and 25.

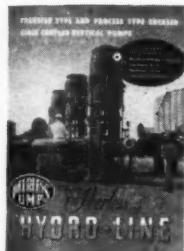
To order personal copies of these bulletins, please fill out the card between pages 4 and 5 or 24 and 25.



229—High Velocity Oil Burners

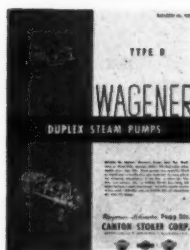
Operating principles and applications of high velocity oil burners are presented in four-page bulletin 107-A. Dimensional data are given for two styles: the standard square tile block type and the shell type. Output curves are given for ten standard models. Other Thermal products also are described briefly. *Thermal Research & Engineering Corp.*

PUMPS & COMPRESSORS



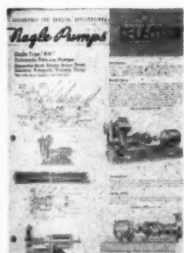
230—Vertical Pumps

Transfer type and process type encased close coupled vertical pumps for application to petroleum refinery techniques, line booster service, condensate service, and chemical process pumping are described in 12-page bulletin B-1700. Construction details are given for each type of vertical pump and its component parts. *Peerless Pump Division.*



235—Steam Pumps

The Type B Wagener duplex steam pump, suitable for asphalt, molasses, syrup, lard, mash, sewage, heavy oil, and other liquids over 1000 SSU, is described in four-page bulletin WS-46. Specifications, dimensions, and table of standard sizes are provided, along with a typical section drawing. *Wagener-Schrader Pump Div., Canton Stoker Corp.*



231—Pump Selection Guide

Four-page condensed catalog "Nagle Pump Selector" gives briefing on various types of Nagle centrifugal pumps, all of which are for abusive service in chemical plants, mines, mills, power plants, and heavy industry. Elevation drawings and cutaways are used to point out operation and construction of each of the types. *Nagle Pumps, Inc.*



236—Industrial Service Pumps

Vertical industrial service pumps for transfer and process service, for extra heavy duty, special duty, and heavy duty are detailed in 16-page bulletin B-505. Factors of good and bad pump design are diagramed and a bibliography given. Photographs of these pumps in use for typical types of service are included. *Peerless Pump Division.*



232—Vertical Turbine Pump

This eight-page Verti-Line Package-Pump bulletin describes units for wells as small as four inches in diameter. Sectional view illustrates construction features. Performance selection tables are included for four and six inch pumps. Sizes of these pumps range from 2 to 7½ hp, with capacities to 7500 gph. *Layne & Bowler Pump Co.*



237—Priming Inductors

This four-page bulletin describes Nagle Priming Inductors for use with Nagle centrifugal pumps or pumps that are not self priming made by other manufacturers. The inductors fit on the entrance pipe of the pumping unit. Engineering data on priming and graphs and typical application photographs are included. *Nagle Pumps, Inc.*



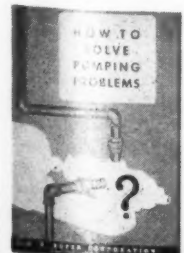
233—General Service Pumps

Bulletin 200, four pages, details general service Unipumps with capacities of 10 to 1800 gpm, for efficient operation when either horizontally or vertically mounted on floor or wall. Minimum space requirements, and low operating and maintenance costs are pointed out. Tables and drawings give pump and motor sizes. *Weinman Pump Mfg. Co.*



238—Air and Gas Compressors

Reciprocating and centrifugal compressors are pictured in operation on many and varied jobs in process industries in this eight-page booklet. Fifteen basic types of compressors are shown and described. Sizes range from 3 to 255,000 cfm, any pressure, to 35,000 psi and any vacuum to 29.6 in. of mercury. *Ingersoll-Rand Co.*



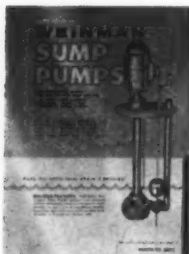
234—Pumping Problems

"How to Solve Pumping Problems," 36-page instruction manual 3060, covers important fundamentals of estimating requirements of the average pumping job. It contains sample problems on hydraulic systems, general transfer, and pressure transfer, plus tables, charts, and other pertinent engineering and design data. *Geo. D. Roper Corp.*



239—Screw Pumps

Screw pumps for non-lubricating fluids and semi-fluids are featured in six-page folder SE-5. A large cutaway view shows construction features. Applications, advantages, and specifications are listed. Company also makes Gearex and Hydrex pumps for lower pressures which are described also. *Sier-Bath Gear and Pump Co., Inc.*



240—Non-Clogging Sump Pumps

Bulletin 500NC, four pages, gives pertinent information and details on Non-Clogging types of Sump Pumps, designed and built for superior performance in handling liquids of varying viscosity, containing foreign matter. Bulletin 500 SP is available on sump pumps for handling liquids with non-fibrous solids. *Weinman Pump Mfg. Co.*



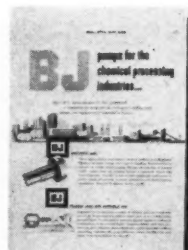
244—Close-Coupled Turbine Pump

Verti-Line Industrial Pumps are described in four-page bulletin 700, which opens to a full length illustration, large enough so that the smallest part can be seen. The new Verti-Line perihedral impeller seal and the new abrasion resistant dual bowl bearing, three types of drives, and five discharge heads are shown also. *Layne & Bowler Pump Co.*



241—Centrifugal Pumps

Single-stage double-suction general-service pumps in sizes from 1½ to 36 in. discharge for capacities up to 25,000 gpm are described and illustrated in 20-page bulletin 7057-C. Selection tables for 50 and 60-cycle performance, dimensions, cross sections, and installation views are included and various drives are shown. *Ingersoll-Rand Co.*



245—Chemical Processing Pumps

This four-page folder provides descriptions of 15 BJ pump styles with application to the chemical processing industries. It also includes information on BJ mechanical seals; sealed, oil filled motors for special service; and Vibron electronic gages for measurement and control of pressure, temperature, flow. *Byron Jackson Pumps, Inc.*



242—Submersible Pumps

This 68-page portfolio—especially compiled for the consulting engineer—contains a series of engineering fact sheets on the submersible pump, complete with drawings, charts, and performance curves. It includes information on selection, applications, special benefits of design, and trouble shooting. *Byron Jackson Pumps, Inc.*



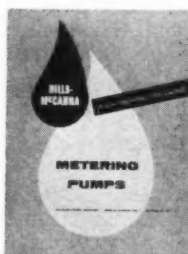
246—Double Suction Pumps

Performance data, dimensions, and specifications on the De Laval single-stage double-suction Types L, M, and P centrifugal pumps, with capacities of 1000 to 20,000 gpm and heads to 350 ft, are presented in six-page bulletin 1004. Features, construction, dimensions, and advantages are described. *De Laval Steam Turbine Co.*



243—Centrifugal Compressors

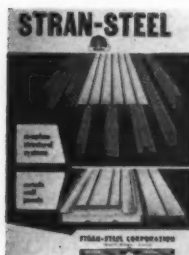
Multi-stage centrifugal compressors, available for inlet volumes of 1000 to 150,000 cfm, are described in ten-page bulletin 0504. Typical installation photographs show the units in use in steel mills, oil refineries, for non-ferrous metal refining, chemical processing, sewage treatment, and food industries. *De Laval Steam Turbine Co.*



247—Proportioning Pumps

Twelve-page bulletin 600 illustrates typical installations for the injection of inhibitors in water conditioning systems using Hills-McCanna Proportioning Pumps. Included are complete specifications, table listing chemicals used in water conditioning, their uses, and pump construction suited to inject them. *Hills-McCanna Co.*

STRUCTURAL MATERIALS & EQUIPMENT



248—Metal Curtain Wall

Metal curtain wall panels and 10 and 12 in. joist are among the new products described in 24-page catalog. Engineering data and detail drawings are given for complete structural systems utilizing Stran-Steel products, along with load tables, design examples, suggested specifications, and descriptions of each product. *Stran-Steel Corp.*



250—Glass Products

Catalog 56-G contains data on the complete line of Mississippi glass products for use in the general building market, industrial, commercial, school, and light construction industries. These products include structural and non-structural figured and wire glass, and Coolite glass for heat absorption and glare reduction. *Mississippi Glass Co.*



249—Steel Roof Deck

A bonderized, baked-enamel prime finish now available on Milcor Steel Roof Deck is described in four-page booklet 621-6. It contains data on Bonderizing and painting operations, types of deck available, technical properties of Bonderite, epoxy-resin enamel, and TI-CO galvanizing, and lists specifications. *Inland Steel Products Co.*



251—Concrete Wall Panels

Insulated precast concrete wall panels and rigid steel framing combined in custom "Panel Bilt" buildings are shown in four-page pamphlet 7285. Panel and structural details are shown for each industrial and commercial purpose described. How this type of construction saves time and money is explained. *The Marietta Concrete Corp.*



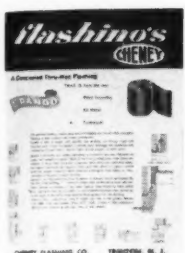
252—Watertight Concrete

Six-page form P-49a is a practical working specification for the design and production of concrete that is watertight against water pressure to which structural concrete normally is subjected. Discussion covers the basic requirements of watertight concrete and test reports illustrate effect of water content. *The Master Builders Co.*



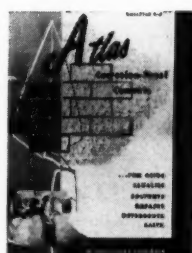
258—Sealing Pressure Leakage

Four-page folder QS-55 outlines the three basic steps in sealing the pressure leakage that occurs in concrete or masonry structures. Two products, Sika No. 2 Quickset for high pressure leakage, and Sika No. 4A Quickset, for moderate pressure leakage, are described in detail along with other sealers and primers. *Sika Chemical Corp.*



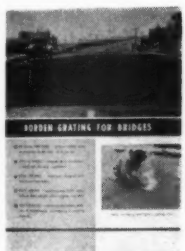
253—All-Metal Flashing

Spando, a concealed through-wall all-metal flashing for spandrel flashing, window head and sill flashing, and for all other concealed flashing in both masonry and frame construction, is introduced in this four-page bulletin. Application, technical data, construction details, and sample specifications are given. *Cheney Flashing Co.*



259—Corrosion-Proof Cements

Twelve-page bulletin 5-2 describes corrosion-proof cements made by Atlas. It gives chemical characteristics, data for estimating amount necessary, and lists typical industries using these cements for protection against acids, alkalis, solvents, greases, detergents, salts, and other industrial corrosive materials. *Atlas Mineral Products Co.*



254—Bridge Grating

"Borden Grating for Bridges," eight-page booklet, describes standard and long span roadway grating, standard and lightweight sidewalk slabs, and standard package beam bridges. It gives design conditions, load tables, specifications, and detailed information to help in specifying these products. *Borden Metal Products Co.*



260—Glass-Aluminum Curtain Wall

Four-page bulletin BRH-1 describes HUETEX, Blue Ridge Glass' new spandrel or curtain wall material—a low maintenance, high quality tempered glass with permanent ceramic color and atomized aluminum welded into one panel. Insulating properties are discussed and color chips show standard colors. *Blue Ridge Glass Corp.*



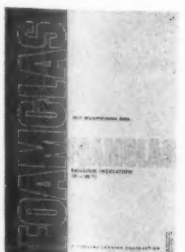
255—Steel Stair Treads

Tread-Grip steel stair treads combine strength of construction with safe, non-slip footing, according to four-page booklet HTP2130. It describes such features as A. W. Algrip nosing, electroforged and welded construction, and twisted cross bars. Detail drawing and tables of dimensions are included. *Horace T. Potts Co.*



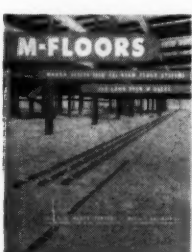
261—Asbestos Cement Roofing

Corrugated asbestos cement roofing and siding is discussed in detail in 16-page data booklet 2032 including specifications, sheet applications, fasteners, closure strips, ridge roll, and trim. Section drawings show application of this company's product, known as Asbestone, to wood and steel frames, and gutters. *National Gypsum Co.*



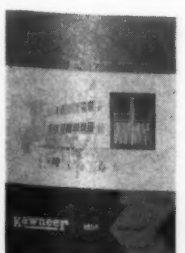
256—Cellular Glass Insulation

"FOAMGLAS Building Insulation," 24-page catalog and reference booklet FB-101, contains complete information on the latest recommended procedures for application of cellular glass insulation on flat roofs, pitched roofs, parking decks, curtain walls, core walls, wall linings, various types of ceilings, and perimeters. *Pittsburg Corning Corp.*



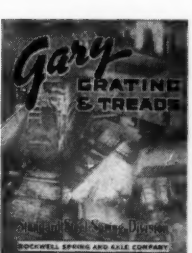
262—Electrified Floor System

Mahon electrified Cel-Beam floor systems and Long Span M-deck designed to safeguard buildings against electrical obsolescence are detailed in new 24-page bulletin M-57. Use with concrete topping and floor covering, use for ceilings, fire resistance ratings, engineering data, and load and property tables are given. *The R. C. Mahon Co.*



257—Metal Wall Construction

"1956 Metal Wall," product catalog insert, contains typical installation pictures of Kawneer Metal Wall—a new concept in metal wall construction. Detailed sections of spandrels, windows, and mullions and jambs are shown to give a clear picture of this type of construction—its advantages and special uses. *Kawneer Co.*



263—Grating and Treads

Gary grating and treads tailor-made to suit your individual requirements are illustrated in a 24-page brochure. Two-page spread includes tables of safe loads, specifications, and other engineering data. Photographs also show many typical applications of the decking. *Standard Steel Spring Div. of Rockwell Spring and Axle Co.*



264—Cellular Floor

Design and construction advantages of Milcor Cellufloor, including electrical flexibility for the future of a building, are discussed in 16-page catalog 270. It contains a table of types and section properties, required section properties for uniform loads and simple spans, engineering data, and construction details. *Inland Steel Products Co.*



265—Unit Wall

A new design tool, 12-page brochure 56004, completely describes the new Kawneer "Unit Wall" curtain wall system for one and two-story buildings. It explains how this system of standardized components makes possible 2582 different combinations of wall units, including door units, for economical construction. *Kawneer Co.*



266—Concrete and Mortar

"Considerations for Concrete and Mortar," four-page bulletin X-6, is a valuable check list of the many factors that must be considered in order to achieve concrete and mortar having the desired properties for the job at hand. It gives a proven way to write specifications that will assure concrete of the required quality. *The Master Builders Co.*



267—Aluminum Building Products

"Alcoa Aluminum Industrial Building Products," 32-page bulletin AD-285, gives a complete list of Alcoa's corrugated industrial roofing and siding products. Included are recommended fasteners and accessories, suggested specifications, and recommendations for erection of this roofing and siding. *Aluminum Company of America.*



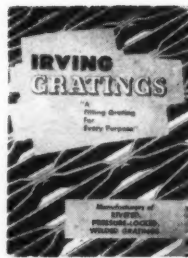
268—Roof Deck

This bulletin describes Robertson's newest product, Long-Span Q-Deck, a deck that will span greater distances without loss of load-carrying capacity. Its use in school and other construction where cost is of prime importance is shown in detail drawings with lists of specifications and engineering data in table form. *H. H. Robertson Co.*



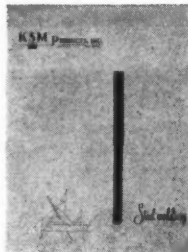
269—Concrete Crossings

Permacrete precast concrete crossing slabs are recommended as a permanent, standard grade crossing in this four-page bulletin. Fillers and flangeways and hold down devices are discussed with accompanying section drawings and layouts. Complete specifications and suggestions for installation are given. *Permacrete Products Corp.*



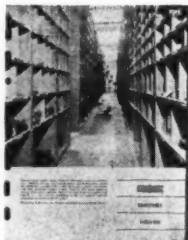
270—Grating Products

This grating products catalog contains illustrations, descriptions, and engineering data on grating-flooring, treads, and industrial floor armoring for walkways, stairways, aisles, floors, bridge decking, and many other industrial and commercial uses. Riveted, pressure-locked, and welded type products are shown. *Irving Subway Grating Co., Inc.*



271—Stud Welding

"Stud Welding" is a collection of bulletins covering the various types of construction for which this method of fastening may be used. It includes data on fasteners, equipment, and application methods for fastening aluminum, steel, and asbestos corrugated roofing and siding, and flat asbestos and insulation board. *KSM Products, Inc.*



272—Adjustable Steel Shelving

The versatile Hallowell system of adjustable steel shelving is described in this 28-page catalog. It covers various types of open and closed shelving, shelving cabinets with swinging and sliding doors, and counter-type shelving units. Possible arrangements of shelving accessories such as drawers are shown. *Standard Pressed Steel Co.*



273—Steel Windows and Doors

In 36-page bulletin BSW-57, Bayley Steel Windows and Doors (also operating units and accessories) are shown in layouts and sizes to modular standards recommended by the Metal Window Institute. Included are drawings and specifications for the new intermediate steel window wall, Series S-150. *The William Bayley Co.*



274—Bridge Flooring

This 32-page booklet contains complete descriptions, specifications, drawings, and design data covering all types of AmBridge I-Beam-Lok. Also included are details of flooring applications plus a brief discussion showing how Composite Tee-Beam Action can be used with I-Beam-Lok. *United States Steel Corp., American Bridge Div.*



275—Floor Panels and Roof Deck

This catalog of engineering information on the Fenestra line of panels and deck for floors, ceilings, and roofs covers Fenestra Electrifyfloor (cellular panel plus header duct system), panels for recessed lighting, acoustical panels, complete insulated roofs, and data for designing for seismic shear and wind loads. *Fenestra, Inc.*



276—Concrete Tester

Job-site testing of concrete with laboratory accuracy is described in bulletin CT-711, "Portable Concrete Testing Machines." Detailed illustrations show testing machines, attachments, and accessories used in tests of concrete cubes, cylinders, and beams. Pertinent data on tests and specifications are given. *Soiltest, Inc.*



282—Curtain Wall Systems

"Bayley Curtain Wall Systems," 12 pages, describes and illustrates curtain wall designs to meet the present trend of skin-wall treatment for building construction, in which window units combined with decorative solid panels constitute the wall assembly. Band, tier, and flush-wall arrangements are detailed. *The William Bayley Co.*



277—Bridge Rehabilitation

New 12-page "Special Engineering Report" contains complete details on repair and strengthening of deteriorated bridge structures with Intrusion-Prepakt methods and materials without interrupting traffic. It describes and illustrates placement of piles and pile caps, and the pressure-filling of cracks. *Intrusion-Prepakt, Inc.*



283—Concrete Fill on Q-Floor

This is the first of a series of booklets giving recommended practices for working on Robertson Q-Floor jobs. It contains detailed specifications for formulation, placement, and curing of the fill, together with well-documented treatises on the nature and reactions of concrete, such as shrinkage cracking. *H. H. Robertson Co.*



278—Bearing Pile Tests

"H-Beam Bearing Pile Tests in Chicago," 12-page bulletin, gives the results of the tests conducted by Armour Research Foundation for U.S. Steel to determine the over-all performance of steel H-beam bearing piles in soil strata found in the Chicago Loop area. Data are tabulated, charted, and discussed in detail. *United States Steel Corp.*



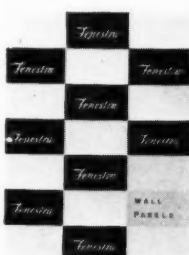
284—Testing Equipment Catalog

This new 128-page catalog describes over 1350 items of apparatus for engineering tests of soils, concrete, asphalt, and construction materials. Items range from sampling and preparation equipment to testing machines for triaxial, unconfined compression, direct shear, California bearing ratio, and similar tests. *Soiltest, Inc.*



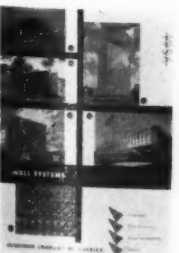
279—Concrete for Sluiceways

This illustrated technical article tells how 24 sluiceways at Chief Joseph Dam, Columbia River, were plugged with Prepakt concrete on a fast time schedule. It includes diagram of typical sluiceway, showing extent of Prepakt concrete plugs. Describes step-by-step procedure followed in placing Prepakt concrete. *Intrusion-Prepakt, Inc.*



285—Metal Wall Panels

This catalog for engineers and architects presents Fenestra insulated panels and siding for curtain wall construction. Complete with installation details, span tables, engineering data, and specifications, it gives reasons for using lightweight panel walls. It covers also acoustical wall panels and movable fire partitions. *Fenestra, Inc.*



280—Aluminum Wall Systems

"Wall Systems of Alcoa Aluminum," 12-page bulletin AD 535, presents advantages of aluminum for wall systems, kinds of systems possible, design considerations, and finishes available. Guide in table form will help you select the Alcoa alloy best suited for each application. Installations are shown in color. *Aluminum Company of America.*



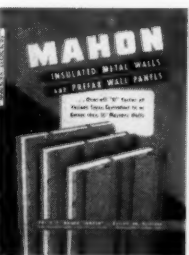
286—Aluminum Windows

Curtain wall designs using the Bayley curtain-wall system with aluminum projected windows are illustrated and explained in 28-page bulletin BAPW57. Suitability of this type of window—provided with or without screens—for buildings of all types of construction and architectural treatment is discussed. *The William Bayley Co.*



281—Storage Walls

This eight-page bulletin introduces Hallowell storage wall—a versatile shelf and drawer system for stocking small parts, file cards, records, and similar items. Illustrations show how nests of steel drawers are stacked and bolted together to form self-supporting walls or partitions for office or shop use. *Standard Pressed Steel Co.*



287—Insulated Metal Walls

Insulated metal walls and prefabricated wall panels of various types with over-all "U" factor equivalent to or better than 16 in. masonry wall are described in 12-page bulletin W-57. Materials, construction, thermal properties, and applications are given for each type along with typical construction details. *The R. C. Mahon Co.*



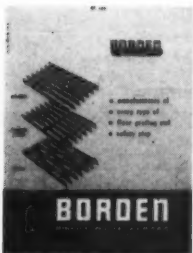
288—Welding Studs

Standard designs and specifications of KSM welding studs are covered in 36-page bulletin G-102. It includes a dimensional drawing of each type of fastener, materials in which each is available, plating, annealing, flux, and arc shield data. Brief descriptions of other welding products also are given. *KSM Products, Inc.*



289—Grating

Safety Grip-Strut, an anti-skid grating in which the vertical members are joined by integral saddle to create lateral struts of great strength, is described in 12-page booklet. General applications, installation and assembly, and fastening devices are discussed. Load tables are given for both steel and aluminum grating. *Globe Co.*



290—Floor Grating and Steps

Eight-page bulletin AT 155 gives complete directions for specifying all types of floor grating and safety steps—all-welded, pressure locked, and riveted. It describes all purpose floor grating of standard and ornamental design, safety grating, types for roadways, and for small building openings. *Borden Metal Products Co.*



291—Gypsum Roof Deck

Specifications, detail drawings, and total load tables for "poured-in-place" gypsum roof deck are included in bulletin 589 in handy loose-leaf form, ready to slip into a notebook. Sample problems and solutions demonstrate use of the load chart. Included are Gold Bond Insulation and Asbestos Cement form boards. *National Gypsum Co.*



292—Accelerating Densifier

"Sikacrete Accelerating Densifier," four-page bulletin SI-56, describes the effects of the material on setting time, gel formation, and structural quality of concrete and mortar, particularly in applications during cold weather construction. Complete specifications and test data will be sent with the folder. *Sika Chemical Corp.*



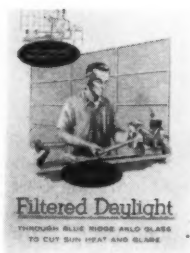
293—Heat Absorbing Glass

The two types of Coolite glass, standard Coolite for absorbing the sun's heat and Glare Reducing Coolite for absorbing heat while reducing glare, are described in this 16-page bulletin. It explains when and where to use the two types and gives specification data and photographs of typical installations. *Mississippi Glass Co.*



294—Bridge Decking

"Decking for Bridges" catalog contains drawings, photos, descriptions, and engineering data on open metal grid bridge roadways. It points out advantages such as light weight, cleanliness, drainage, safety, durability, strength, and traction, as well as the economies effected through minimum maintenance and long life. *Irving Subway Grating Co., Inc.*



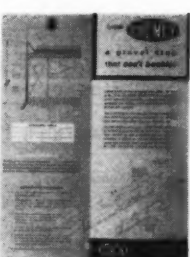
295—Filtered Daylight

Eight-page bulletin BRA 6 tells how Blue Ridge Aklo Glass filters daylight for better seeing, less eyestrain, and provides cooler interiors in new buildings or old. Information is given on how to select the right Aklo glass for specific applications. Photographs show typical installations in various types of industries. *Blue Ridge Glass Corp.*



296—Rigid Frame Buildings

Stran-Steel's new series of industrial and commercial rigid frame structures, 50 and 60 ft bow string buildings, and Stran-Satin metal wall are detailed in 18-page catalog 56-I-109. Illustrations show these buildings in use as manufacturing plants and warehouses, for retail operations, and municipal installations. *Stran-Steel Corp.*



297—Gravel Stops

Gravel stops by Cheney, constructed with a concealed locking splice plate that forms an expansion joint every 8 ft. and holds down the fascia band without exposed nailing, are detailed in this bulletin. Installation procedure, specifications, detail drawings, and information on special dimensions and designs are given. *Cheney Flashing Co.*

WATER TREATMENT AND WASTE DISPOSAL



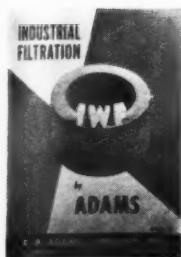
298—Automatic Water Softeners

Bulletin 400A describes automatic water softeners for heavy duty service. Complete specifications are listed for 17 stock models, with installation diagrams and operation information included. Stock models in capacities up to 1,500,000 grains, single unit; 3,000,000 grains, twin unit. Flow rates to 100 gpm. *Bruner Corp.*



299—Filmeen Treatment

Control of corrosion in return lines through the use of Filmeen treatment is described in eight-page bulletin 5013-B. It explains how this product prevents corrosion caused by CO₂ or oxygen by forming a protective, monomolecular film on metal surfaces. Methods of application and testing are outlined for specific uses. *Dearborn Chemical Co.*



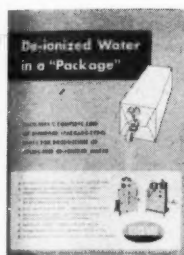
300—Industrial Filtration

How industrial filters lower production costs is explained in ten-page bulletin 651. Data on the new line of IWF filters include sectional views, typical installation drawings, dimension charts, and operational diagrams. Case histories of city water filtration and filtering of recirculation water are cited and illustrated. R. P. Adams Co., Inc.



306—Water and Steam Cycles

"Industrial Water Treatment and Engineering Service" tells of the five basic lines of defense to guard against difficulties in water and steam cycles. A two-page diagram shows a water and steam cycle power plant layout and indicates the usual tests required on samples taken at designated points. Dearborn Chemical Co.



301—Packaged De-ionizer

"De-ionized Water in a Package," four-page folder PK-256, describes a complete line of standard (package-type) units for production of solids-free de-ionized water. Labeled pictures show units that produce low-solids water and units that produce chemically pure water. Portable de-ionizers are described. Illinois Water Treatment Co.



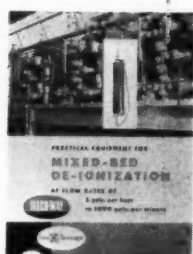
307—Water Softeners

Bulletin 200A deals with manual type softeners with single lever multiport valve control. Complete specifications are listed for 17 stock models, with installation diagrams, descriptions, and operation data included. Capacities are to 1,500,000 grains single unit, 3,000,000 grains twin unit; flow rates to 175 gpm. Bruner Corp.



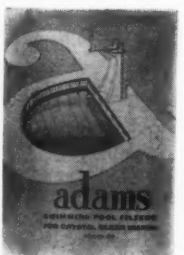
302—Water Supply

"Supplying Water for Municipal and Industrial Use," 20-page catalog, explains how the Ranney Method can provide any type of water program for these users. Horizontal collectors, infiltration galleries, venturines, and intakes are fully described. Photographs and schematics depict each operation. Ranney Method Water Supplies, Inc.



308—De-ionization

Equipment for mixed-bed de-ionization at flow rates of 5 gph to 5000 gpm is described in eight-page bulletin. Diagrams illustrate each phase of operation—service, backwash, simultaneous regeneration, and mixing. Packaged units shipped completely assembled with piping and controls are described briefly. Illinois Water Treatment Co.



303—Swimming Pool Filters

Bulletin 625, 24 pages, discusses filtration for modern swimming pools of 50,000 gal capacity and over. It has sections on design features of purification and filtering systems, operation phases of filtration cycle, choosing the right filter, installation drawings, dimension charts, and table of filter sizes. R. P. Adams Co., Inc.



309—Deaerating Heaters

Distinctive features and operating advantages of Graver Tray-Type Deaerating Heaters are discussed in 12-page bulletin WC-106. The bulletin explains that units are available for application to every type of heat balance in central power generating stations as well as in industrial power plants. Specifications given. Graver Water Conditioning Co.



304—Hot Process Softeners

Bulletin WC-102A, 36 pages, describes different chemical treatments employed for boiler feedwater and the various types of Graver Hot-Process Softener units available for feedwater treatment. Typical flow sheets and installations are shown, along with cutaway views and lists of specifications. Graver Water Conditioning Co.



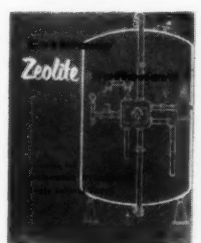
310—Zeolite Water Softeners

Zeolite water softeners designed to meet any soft water need or capacity are described in bulletin 211. Units produce water of zero hardness with one pass through exchanger bed. Folder discusses chemistry, diagrams operation, and details unit types with automatic, semi-automatic, or manual operation. Industrial Filter & Pump Co.



305—Demineralizing Handbook

Publication 5800, "Cochrane Handbook on Demineralizing," goes into a detailed description of the demineralizing process and various applications in efficient removal of silica. Flow diagrams and photographs of several types of installations are included to show how this equipment can serve your client. Cochrane Corp.



311—Water Softeners

"Zeolite Softeners," 20-page publication 4520, deals with the necessity for water softening, explains the fundamentals of softening and the selection of equipment and zeolites. It describes also operation of the Cochrane Hydromatic Valve for manual or automatic control of the cycling phase of the process. Cochrane Corp.

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